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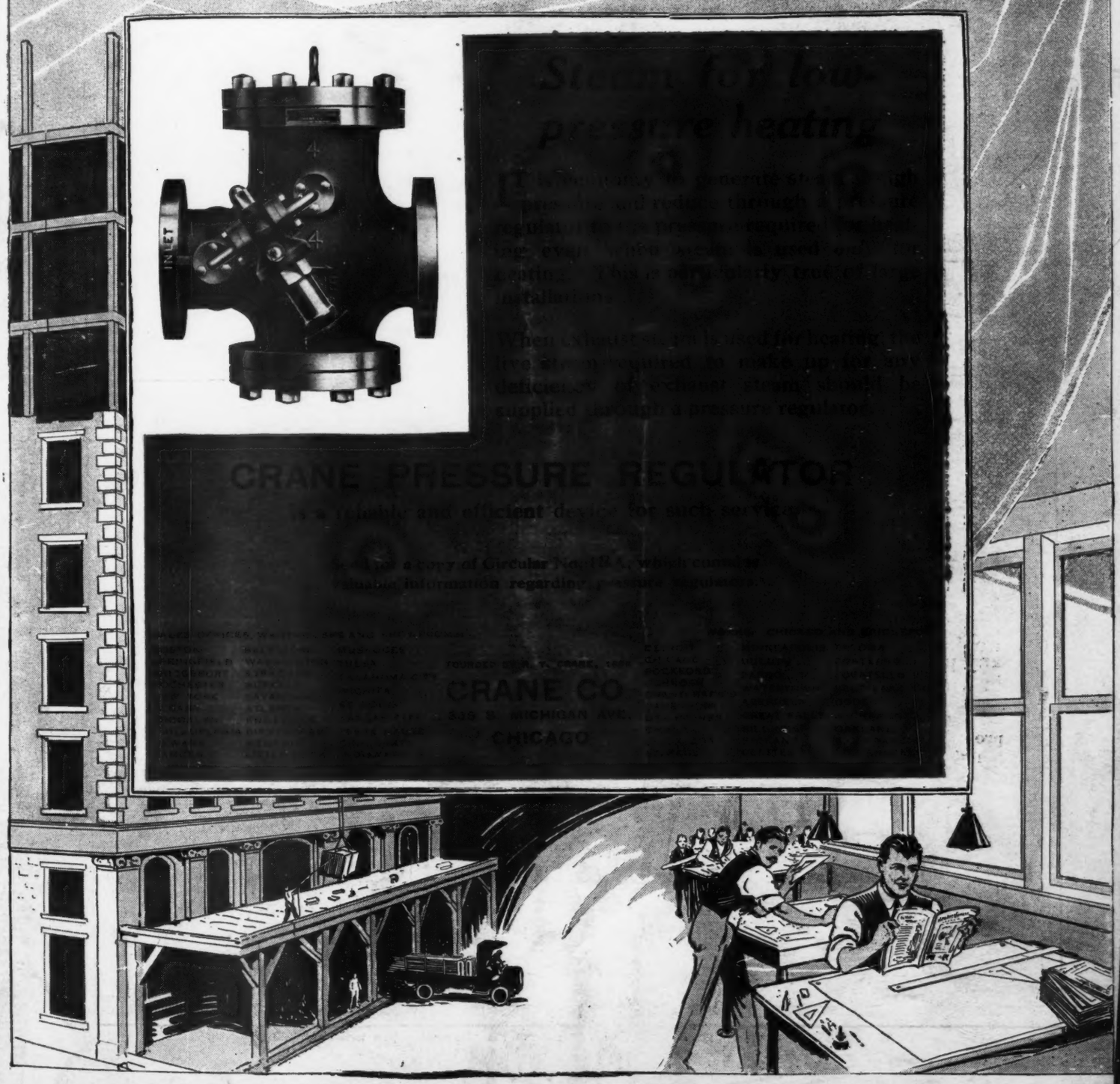
The Heating and Ventilating Magazine

A MONTHLY JOURNAL of ENGINEERING PROGRESS

Vol. XVII. No. 4
$2.00 a year 20 cents a copy

APRIL 1920

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway



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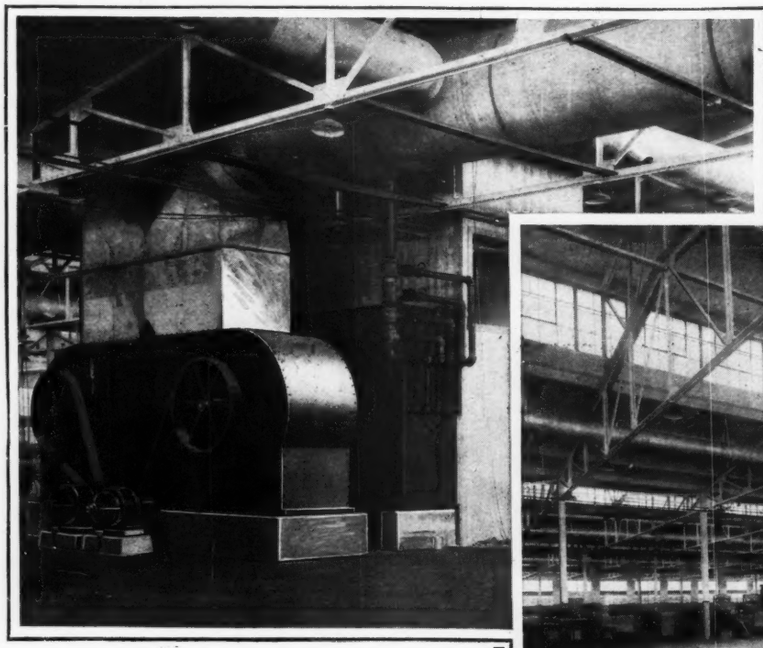

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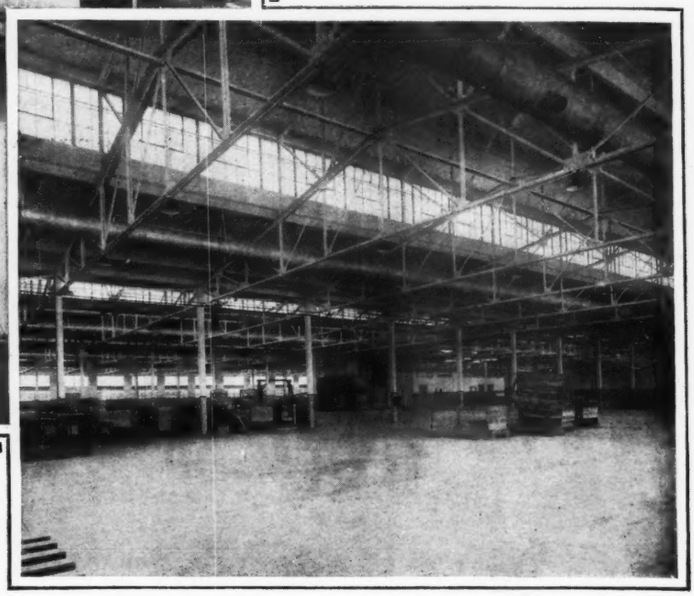
Kalamazoo Sheet Metal Mfg. Co., erected and installed the Sheet Metal Piping System.



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CATHEDRAL OF SS. PETER AND PAUL, WASHINGTON, D. C.

HEATING SYSTEM FOR A MODERN CATHEDRAL

Scheme Adopted for Counteracting Cold Drafts in Lofty Interior, Together with Unique Method of Heat Control.

I.

By CHARLES L. HUBBARD.

MANY points of practical value for general use are to be noted in the system of heating planned by Professor S. Homer Woodbridge, of Boston, for the Cathedral of Ss. Peter and Paul (Episcopal) St. Alban, Washington, D. C., now under construction. These points apply especially to auditoriums or other spaces of considerable height where cool down-drafts must be guarded against.

The system of steam distribution and the method of temperature regulation are unique and perhaps the only ones of their kind and size to be found. Furthermore, the simplicity of this arrangement adapts it for general use in many classes of buildings where steam is used for heating.

CATHEDRAL BEING BUILT IN SECTIONS.

It should be stated that the cathedral is being built in sections, its erection extending over a period of

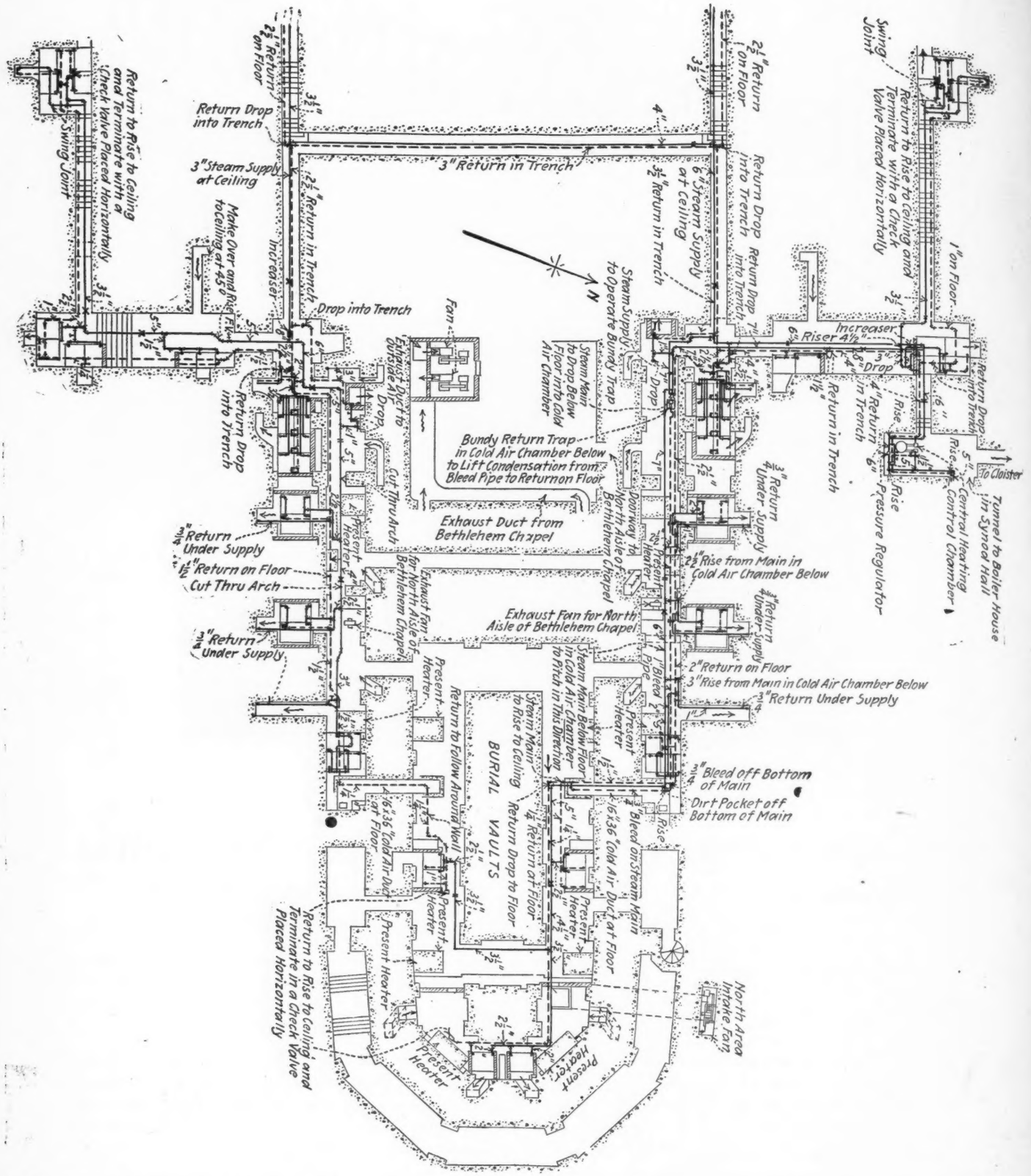

Return to Rise to Ceiling and Terminate with a Check Valve Placed Horizontally
Swing Joint
2½" Return on Floor
Return Drop into Trench
3" Steam Supply at Ceiling
3" Return in Trench
2½" Return in Trench
Make Over and Rise to Ceiling at 45°
Increaser
Drop into Trench
Return Drop into Trench
Fan
Exhaust Duct to Outside Air
Steam Main to Drop Below Floor into Cold Air Chamber
Steam Supply to Operate Bundy Trap
Bundy Return Trap in Cold Air Chamber Below to Lift Condensation from Bleed Pipe to Return on Floor
Exhaust Duct from Bethlehem Chapel
Cut Thru Arch
¾" Return Under Supply
½" Return on Floor
Present Heater
Exhaust Fan for North Aisle of Bethlehem Chapel
Doorway to North Aisle of Bethlehem Chapel
2½" Rise from Main in Cold Air Chamber Below
Exhaust Fan for North Aisle of Bethlehem Chapel
Steam Main Below Floor in Cold Air Chamber to Pitch in This Direction
Steam Main to Rise to Ceiling
Return to Follow Around Wall
BURIAL VAULTS
Return Drop to Floor
¼" Return at Floor
16"x36" Cold Air Duct at Floor
Present Heater
Bleed off Steam Main
Dirt Pocket off Bottom of Main
Return to Rise to Ceiling and Terminate in a Check Valve Placed Horizontally
North Area Intake Fan
Swing Joint
Return to Rise to Ceiling and Terminate with a Check Valve Placed Horizontally
1" on Floor
Increaser Riser 4½"
Return Drop into Trench
Return in Trench
Pressure Regulator
Central Heating Control Chamber
To Cloister
Tunnel to Boiler House in Synod Hall
2" Return on Floor
3" Rise from Main in Cold Air Chamber Below
¾" Return Under Supply
¾" Bleed off Bottom of Main
Dirt Pocket off Bottom of Main
N

FIG. 1—SUB-BASEMENT PLAN, CATHEDRAL OF SS. PETER AND PAUL, WASHINGTON, D. C., EAST END, SHOWING INDIRECT HEATING SYSTEM.

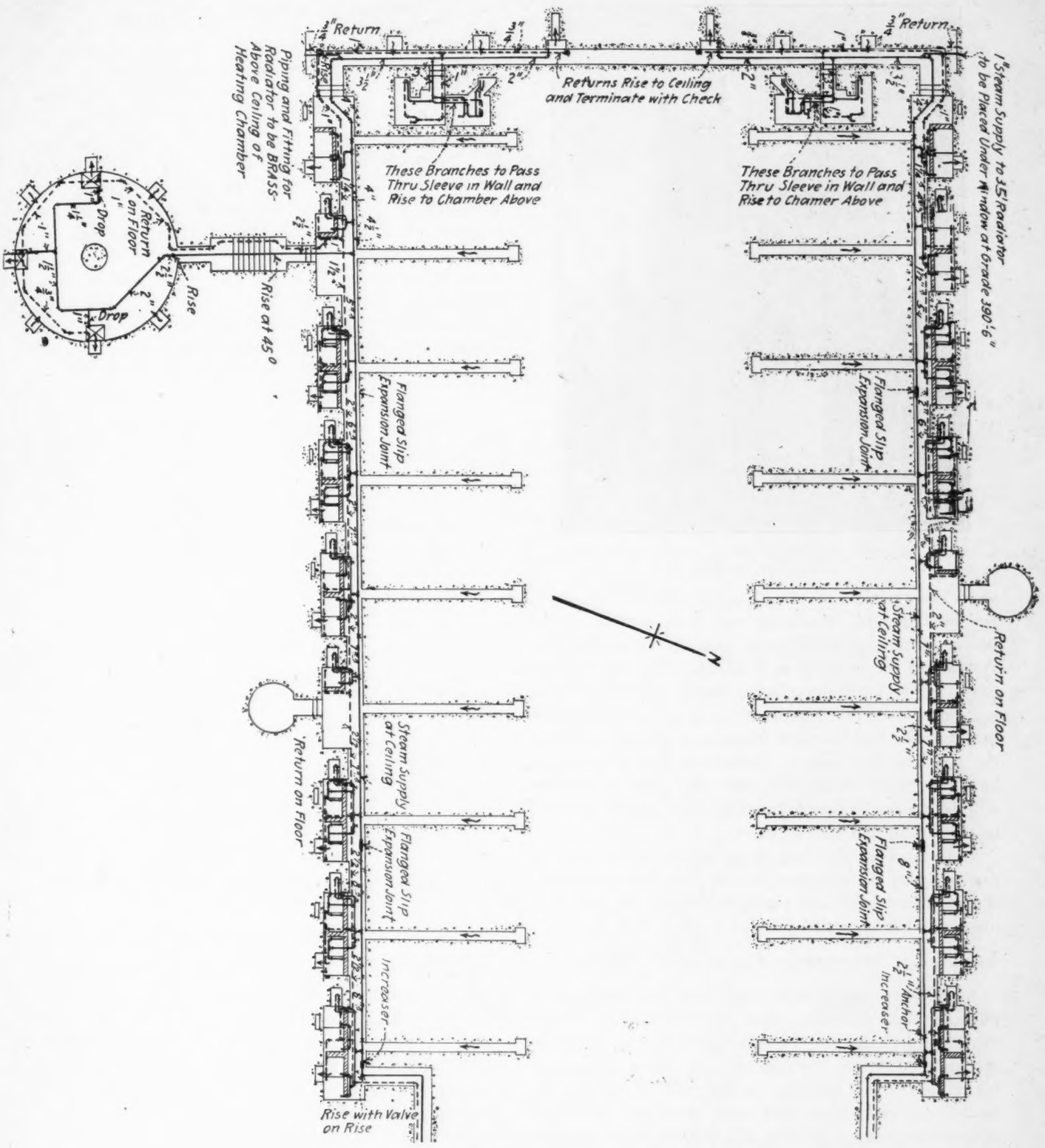
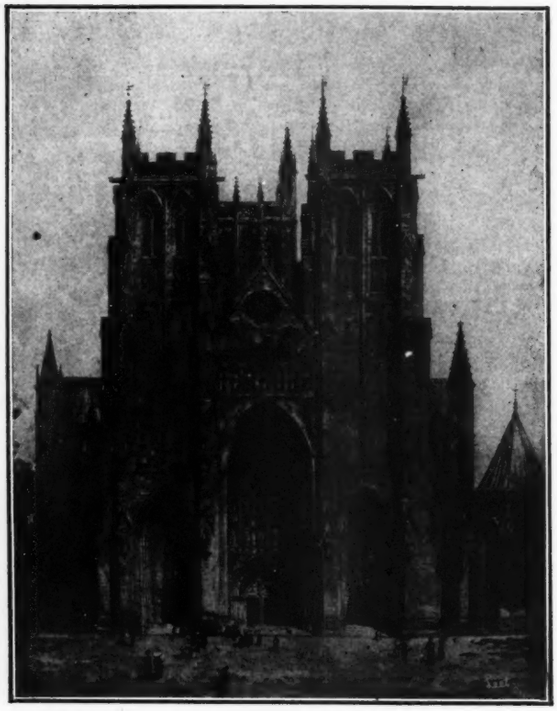

3/4" Return
3/4" Return
3/4" Return
Returns Rise to Ceiling and Terminate with Check
1" Steam Supply to 35' Radiator to be Placed Under Window at Grade 390'6"
Piping and Fitting for Radiator to be BRASS Above Ceiling of Heating Chamber
These Branches to Pass Thru Sleeve in Wall and Rise to Chamber Above
These Branches to Pass Thru Sleeve in Wall and Rise to Chamer Above
1" Drop
Return on Floor
Drop
Rise
Rise at 45°
Flanged Slip Expansion Joint
Flanged Slip Expansion Joint
Steam Supply at Ceiling
Return on Floor
Return on Floor
Steam Supply at Ceiling
Flanged Slip Expansion Joint
Flanged Slip Expansion Joint
Increaser
2½" Anchor
Increaser
Rise with Valve on Rise
N

FIG. 1-A—SUB-BASEMENT PLAN, CATHEDRAL OF SS. PETER AND PAUL, WASHINGTON, D. C., WEST END, SHOWING INDIRECT HEATING SYSTEM.



WEST FRONT, CATHEDRAL OF SS. PETER AND PAUL, WASHINGTON, D. C.

years and certain temporary means have been employed for heating and ventilating the first portion erected before Professor Woodbridge took up the design of a system for the building as a whole. This has made it necessary to incorporate some minor features in connection with certain rooms which would probably have been omitted had the final plans been completed before the building was begun. Details of this kind, which have but little connection with the general scheme, will be touched upon but lightly, or omitted entirely, in the description which follows.

Some idea of the magnitude of the plant may be gained from an inspection of Fig. 1 which represents the indirect heater and piping layout in the sub-basement, the total length of which is about 450 ft.

MECHANICAL VENTILATION FOUND TO BE UNNECESSARY.

Aside from three small fans installed for special purposes in connection with the ventilation of the chapel and choir, and for starting the flow of air in the right direction through certain flues, when first warming up the building in the fall, no means of mechanical ventilation have been provided. This decision was made on account of the large cubic contents of the building, the moderate size of the congregations in usual attendance and the shortness of the service as compared with the more continuous occupation of other auditoriums, like legislative or judicial halls, theatres, concert chambers, etc. Under usual conditions it was assumed that the contained air would possess a sufficient degree of purity, while on extraordinary occasions recourse could be had to increased natural ventilation through towers and windows, as will be noted later.

METHOD OF ADMITTING OUTSIDE AIR.

Since one-half of the lower row of windows is supplied with warm air through openings in the sills, cool outside air may be admitted without troublesome drafts by hinging a section of the sash at the bottom and swinging it inward, as shown in diagram in Fig. 2. By providing side-stops, or "checks," the rising warm air will mingle with the entering cool air, as indicated by the arrows in the illustration, and the mixture of tempered air will tend to pass into the room at an upward angle without falling directly upon those below, as would be the case if the cold air were allowed to enter without this precaution. Discharge ventilation from the main auditorium is provided for through the ceiling of the tower by way of trap doors or panels having an aggregate area of 150 sq. ft.

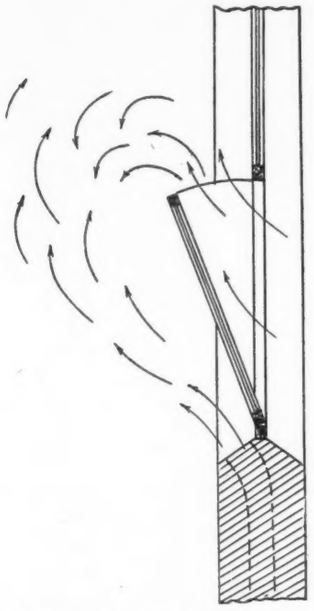


FIG. 2—ARRANGEMENT OF WINDOW SASH TO ADMIT OUTSIDE AIR.

USE OF SUPPLEMENTARY FANS.

Mention has already been made of small supplementary fans for special purposes. One of these, a 6-ft. cone fan, is shown in Fig. 1, near the northeast corner of the building. This has a capacity of 8000 cu. ft. of air per minute and is arranged by means of switch dampers for passing it either into the chamber beneath the chapel for mingling with the air in rotation and for freshening that entering the cathedral, or the whole amount may be passed directly into the chapel as desired. Another service of this fan is to supply sufficient pressure to force the air upward through the two rotation flues located at this end of the building, and at such times as there may be a tendency to reversal of air flow, when the flues are cold and heat is first turned into the building. Two exhaust fans are used for withdrawing air from the chapel; they are shown in Fig. 1, near heaters 7 and 8, respectively.

INDIRECT HEATERS USED TO WARM BUILDING.

The system used to warm the main auditorium consists of approximately 70 indirect heaters, located in the sub-basement within chambers, ranged for the most part along the outer walls, as shown in Fig. 1. The indirect method was chosen because of the architect's objection to the presence of direct radiators anywhere within the cathedral proper, and also because of the difficulty of placing the large amount of direct surface required without enroaching upon space needed for other purposes.

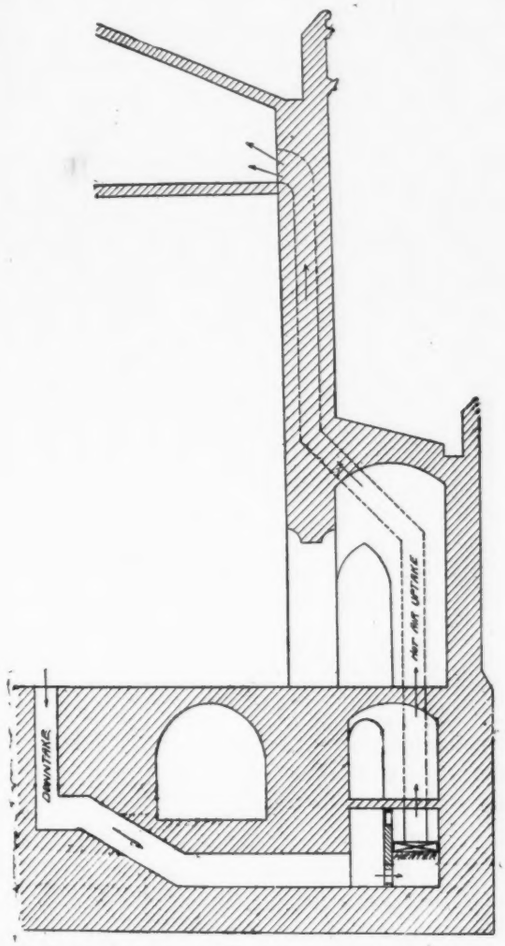


FIG. 3—GENERAL ARRANGEMENT OF HEATERS AND FLUES.

The general arrangement of the heaters and flues is shown in Figs. 3 and 4. They consist of two groups of rotation circuits, each set being made up of a number of independent units consisting of an air downtake, a heater and a warm air uptake. About two-thirds of the heated air is delivered to the upper part of the cathedral, entering at the triforium level, as indicated in Fig. 3. The downtake for each heating unit, or circuit, in this group starts at the level of the main floor, in line with the nave piers, and is carried across to the heating chamber as shown. The warm air is delivered through a flue about 60 ft. in height. The temperature of the warm air (about 115° F.) and the height of the flue tend to produce a strong draft through the heater, thus increasing its efficiency beyond that usually obtained in indirect rotation heating, with flues of ordinary height. There are about 30 of these heating units supplying warm air to the triforium level, and an equal number delivering air at practically the same temperature through openings in the sills of alternate windows in the lowest tier, as shown in Fig. 4.

The downtakes to the heaters in this group are from the sill levels in the remaining windows (see A, Fig. 4) and are therefore of the same vertical length as the warm air uptakes, which is approximately 25 ft.

HEATING CHAMBERS INDEPENDENT OF EACH OTHER.

As previously stated, each heating chamber with its downtake and uptake, is entirely independent of the others, so that there is no danger of those having a stronger draft weakening the circulation of nearby units. There would be especial danger of this if a connection existed between heating chambers leading to the higher and lower levels, because the longer uptakes have a much stronger "pull" which might be sufficient in some cases to reverse the direction of flow in the shorter ones.

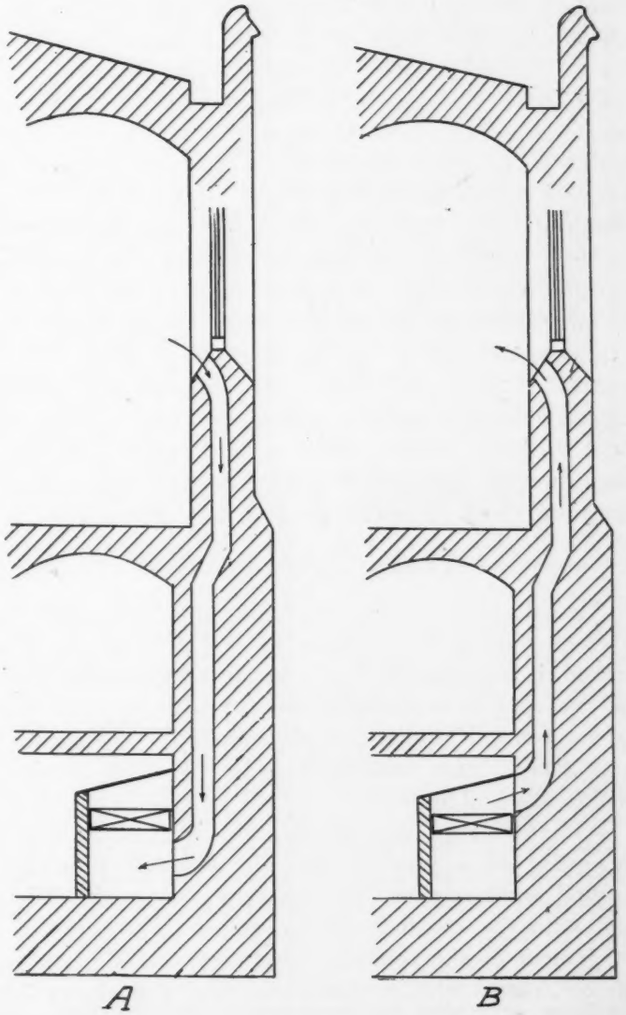


FIG. 4—HEATERS AND FLUES DELIVERING AIR TO AND TAKING AIR FROM WINDOW SILL LEVELS.

AIR LEAKAGE BEYOND CERTAIN LIMITS TO BE REMEDIED BY STOPPING CRACKS.

The heating surface has been proportioned to the computed heat loss from the building under conditions of severely cold, cloudy and mildly windy weather, special allowance being made for the excessive inleakage of air around the multitude of small leaded panes of glass which are liable to become loosened in time and so increase the cooling effect. It is distinctly provided, however, that future possible difficulty in heating, due to this cause, shall be remedied by such measures as shall reduce the leakage rather than by increasing the capacity of the heating plant. It is a not uncommon occurrence to blame the heating system for faulty results when the real trouble lies in the poor construction and ill fitting of doors and windows. In cases of this kind, attention should be given to stopping the waste of heat, rather than by supplying more to offset the waste.

ADVANTAGE OF HIGH STEAM TEMPERATURES IN HEATING STACKS.

A normal steam pressure of 10 lbs. gauge has been counted upon to give the necessary heat under the conditions noted, but in designing the system, provision has been made for carrying higher pressures up to 50 lbs. or more, should any rare occasion require such increase in heating capacity. Assuming air to be delivered to the heaters at 60° F. and with steam at 10 lbs. pressure, the temperature difference between the air and heater is $240 - 60 = 180°$. With steam at 50 lbs. pressure, this difference becomes $298 - 60 = 238°$. As the radiator efficiency varies nearly as the temperature difference, other conditions remaining constant, the relative heat transfer would be raised to $238/180 = 1.32$, an increase of 32%. As a matter of fact, the higher air temperatures would increase the flue velocity and so raise the velocity of flow over the heater, which in turn would still further increase the rate of heat transfer, thus making the total result somewhat greater than noted above.

SAVING EFFECTED BY RECIRCULATING AIR.

Assuming an inside temperature of 60°, and an average outside temperature of 40° for the heating season, it is estimated that a saving of about 500 tons of coal per year may be realized over what would be necessary if the entire air supply for the heaters was taken from outside, instead of being rotated within the building.

With the large volume of pure air present at the beginning of a service, with the constant inleakage around window panes and through roof construction, and with the constant air movement due to the arrangement of the rotation flues, there would seem to be no reason why economies in fuel should not be adopted through the method indicated. This becomes all the more important when fixed charges on expensive ventilating equipment and the operating cost of the same are taken into account, as well as fuel charges.

METHOD OF PREVENTING COLD DOWN-DRAFTS.

In arranging the air flues in connection with the heaters, special study has been given to the avoidance of cold drafts, which are a vital matter in the heating and ventilation of any large auditorium. In the present case, the conditions favoring down-drafts are especially strong, owing to the rapid cooling of the air

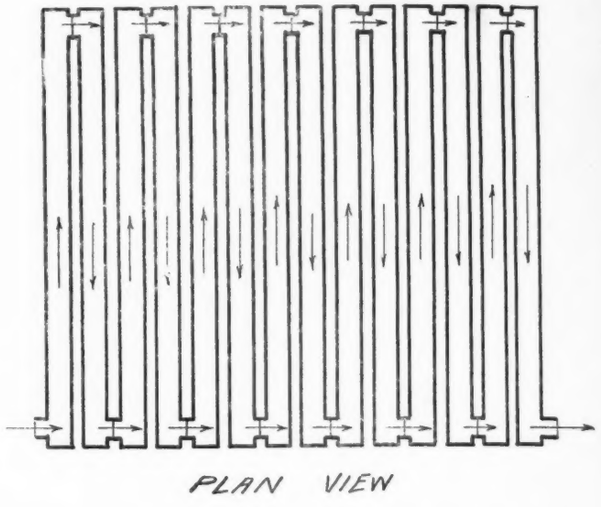


FIG. 5—CONSTRUCTION OF INDIRECT HEATERS.

in the upper part of the structure, this being due to the comparative thinness of walls and roof, large window area and air leakage. If the greater portion of the warm air was admitted to the lower part of the building, as is commonly done, its buoyancy and strong upward movement would tend to force down the columns of cooler air and so intensify the natural tendency to down-drafts already present.

To avoid this condition, about two-thirds of the warm air is delivered to the upper part of the building, as illustrated in Fig. 3. While the number of flues is the same as that supplying the lower part, they are given a sectional area one-third larger, and this, in connection with the higher air velocity, due to their greater length, accounts for their greater effectiveness in the transmission of heat.

Special care has been taken in the treatment of the choir and chancel section of the cathedral to protect them against down-drafts. Here the air has been heated to a higher temperature than for the remainder of the building and is admitted at such an elevation as to mix with the cooler air and pass in horizontal currents across this section without producing down-drafts

FEATURES OF FLUE CONSTRUCTION

All flues, where possible, are of glazed tiling, circular where the masonry is sufficiently massive, and rectangular elsewhere. When, for any reason, the

construction is such that tile cannot be used, a lining of sheet copper is provided. Permanent linings are considered desirable, both for protecting the flue from falling mortar during construction and also for providing a smooth interior finish which will reduce friction to a minimum and offer the least opportunity for the accumulation of dust.

CONSTRUCTION OF INDIRECT HEATERS.

The indirect heaters are made up of Utica pin sections, this particular pattern being chosen on account of the "trombone" form when made up in the

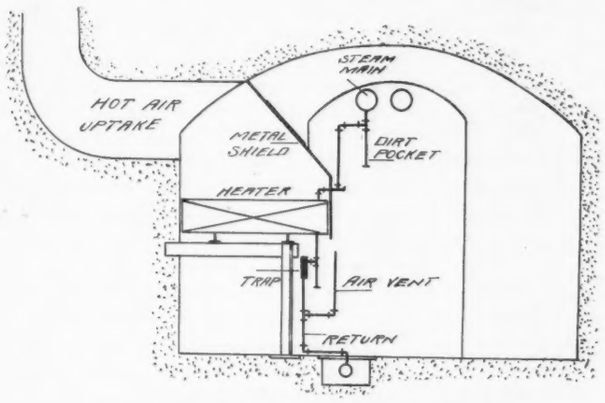


FIG. 6—TYPICAL HEATER AND MOUNTING.

stack, as shown diagrammatically in Fig. 5. This continuous passage is necessary to complement the action of the particular system of steam supply adopted and which is described at a later point. Typical heaters and their mountings are shown in Figs. 6 and 7.

Different units vary more or less according to their location and size, but the general principle involved is practically the same throughout the building. The stacks are supported upon iron beams resting either

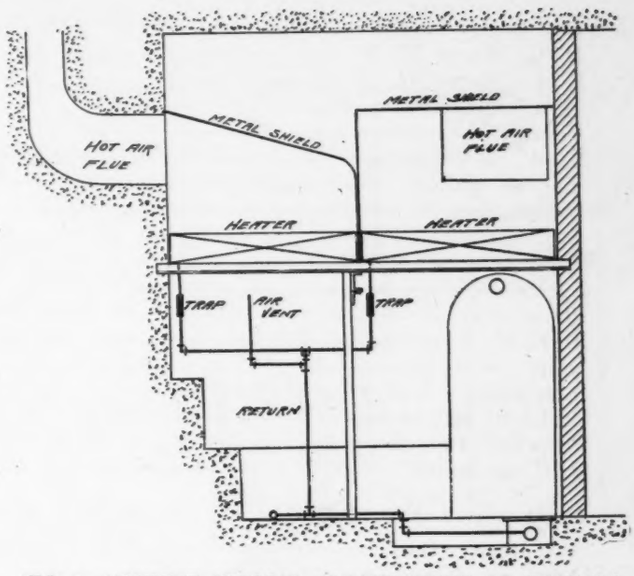


FIG. 7—ANOTHER TYPICAL ARRANGEMENT OF HEATERS AND MOUNTINGS.

in the masonry sidewalls or upon iron columns, according to local conditions. As far as possible the enclosing chambers are constructed of brick and tile laid in cement mortar and finished with a wash of pure cement to insure tightness against air leakage. Metal shields, however, are quite generally used over the tops of the heaters for closing in the warm air spaces and connecting them with the uptake flues. This metal is heavy galvanized iron, protected with a suitable paint.

(*In the concluding installment, to be published in next month's issue, Mr. Hubbard will describe at length the method adopted by simplifying the regulation of the flow of steam to the heaters. He will also discuss the air venting and return of condensation, and some of the more interesting construction details.*)

PLAN AND SPECIFICATION DATA SHEETS FOR HEATING AND VENTILATING

IV.

(*Concluded from March issue.*)

FANS. (Sixteen.)

See line 39, preliminary sheets.
Apparatus No. _____
Kind _____
No. (size) _____
Housing _____
Diameter blast wheel _____
Width of periphery _____
Number of spiders _____
Number of inlets _____
Size of inlets _____
Number outlets _____
Size of outlets _____
Support bearings on _____
Diameter of pulley _____
Face of pulley _____
Cubic feet air _____
R. P. M. _____
Size of fan engine _____
Kind of fan engine _____
Kind of sub-base _____
How connected to fan _____
R. P. M. _____
Coupl. or belt kind _____

Size pulley ———
D. C. Motor H. P. ———
D. C. Motor R. P. M. ———
How connected to fans ———
Voltage ———
Kind of coupling ———
Size of pulley ———
Foundations ———
A. C. motor H. P. ———
Type ———
Cycles ———
Phase ———
R. P. M. ———
Volts ———
Size pulley ———
Width of belt ———
Propeller fans ———
D. C. or belted ———

Fans.

How many fans ———
Diam. of fans ———
R. P. M. ———
Cu. ft. air ———
Motor voltage ———
A. C. Cycles ———
Phase ———
Motor R. P. M. ———
Position of shaft ———
Wiring done by ———
Foundations by ———
Foundations of ———
Coupling ———
Deadener ———
Is wiring provided for? Encase motor if out of sight of starting switch. See lines 79-81 preliminary sheets. Place deadener under motor; and oil pan if on wood floor.

Heaters—Vento.

Apparatus No. ———
Kind of foundations ———
Total number groups ———
Number of groups wide ———
Number of groups deep ———
Number sections deep ———
Size of sections ———
C. to C. of sections ———
Total sections ———
Total square feet ———
Vertical or horizontal ———
Sheet metal connection to ———
Connection to each group ———
Connection to entire heater ———

Heaters—Pipe

Apparatus No. ———
Kind foundations ———
Number sections ———
Number rows deep ———
Vertical or horizontal ———
Actual lineal feet pipe ———
Free area square feet ———
Operate at pounds pressure ———
Air velocity through ———
To warm cubic feet air ———
From temperature of ———
To temperature of ———
Sheet metal connection to ———
Hand or auto control ———
Connection to each section ———
Connection to entire heater ———

SHEET METAL WORK. (Seventeen.)

Ducts:
See that indirect stacks do not interfere with head-room of light and have proper supports so that floor will not sag.
Do not put indirect stack in toilet room.
Increase vertical diameter of air openings 2 in. for 4-in. wall, 4 in. for 8-in. wall and 6-in. wall, and chamfer the edge behind openings.
Are hot air reliefs provided where necessary?
Show fresh air and vent ducts and stack casings to scale.
Toilet fixture vents ———
Solder joints where ———
Deflectors or diffusers ———
Stack casings ———
Hot air space ———
Cold air space ———
Radiators (height) ———
Foot warmers (where) ———
Gossamer checks required? ———
Dampers: (Show all dampers so far as possible.)
Shut-off ———
Adjusting ———
Mixing ———
Vent ———
Rotating ———
Doors ———
Ventilators: See lines 31 to 34 preliminary sheets.
Ventilators furnished by whom ———
See that they are properly located and arranged.
Plank curb furnished by whom (Mark plans)
Show water tight pan under same and drip therefrom to ———
Location ———
Number ———
Size ———
Round, square or rectangular ———

REGISTERS AND GRILLES. (Eighteen.)

See lines 82 to 85, preliminary sheets.
Show all registers, register faces, grilles, etc.
See that there is a damper or register for each vent.
Mark registers, Reg. (or R.).
Mark register faces, Reg. Face (or R. F.).
Mark grilles, Grilles (or G.).
Give width first and show in correct position.
Show grilles and screen at outside cold air openings.
Use registers at ———
Use register faces at ———
Use grilles at ———

AIR FILTERS AND WASHERS. (Nineteen.)

See lines 86, preliminary sheets.
Air filters
Type ———
Number of bags ——— Dia. ——— in. Length ———
Provide grille to prevent bags drawing into fan air washer.
Make ———

CONDUIT WORK. (Twenty.)

Underdrain:
Where placed and size ———
Conduits:
Sizes ———
Supporting tees:
Distance center to center ———

PITS AND MANHOLES. (Twenty-one.)

By whom built ———
Where ———
Style ———
Size ———
Covers ———

FOUNDATIONS. (Twenty-two.)

By whom built ———
For what apparatus ———
Built of ———
Top how finished ———

Dimension prints from ———

TRENCHES.

By whom built ———
Show location, dimensions, how built and kind of covers.

SWEEPER PLANT.

See line 87, preliminary sheets.
Show a ——— sweeper plant, compressor to be driven by a ——— h. p. ———
Show ———riser lines to ———floor.
Make to show ———

MECHANICAL EQUIPMENT OF THE EAST SIDE HIGH SCHOOL, CINCINNATI, OHIO

Details of Installation, Showing Methods Followed in Handling Group of Buildings

By CHARLES F. JORDAN,

Chief Engineer of the Board of Education, Cincinnati, Ohio.

(*Concluded from March issue*)

TEMPERATURE REGULATION.

All room control except that for the auditorium and dining room was installed by the Johnson Service Co. This concern also installed two 6-in. x 10-in. Westinghouse air compressors which maintain a pressure of 120 lbs. Installed in the pump room is a 30-in. x 60-in. high-pressure storage tank. From this tank air is taken through a filter into a 3/4-in. high-pressure line into each building where this air is stepped down through two pressure-reducing valves to 15 lbs. into a low-pressure storage tank for each building.

Each of these tanks is equipped with a filter on the high-pressure side of the pressure-reducing valves. These tanks are also equipped with a spring safety valve set to open at 18 lbs. to prevent the bursting of diaphragms on thermostats should the pressure-reducing valves for any reason fail. The high-pressure storage tank in the pump room is also provided with a safety valve set to open at 150 lbs. Air for the pneumatic tools used in the Manual Arts Building will be supplied from storage tank. In each building an opening is left in the high-pressure air line for hose connections for blowing out motors.

COIL, DAMPER AND POOL CONTROL.

Automatic temperature regulation is provided for ventilating units in buildings A, B, C, D and E and

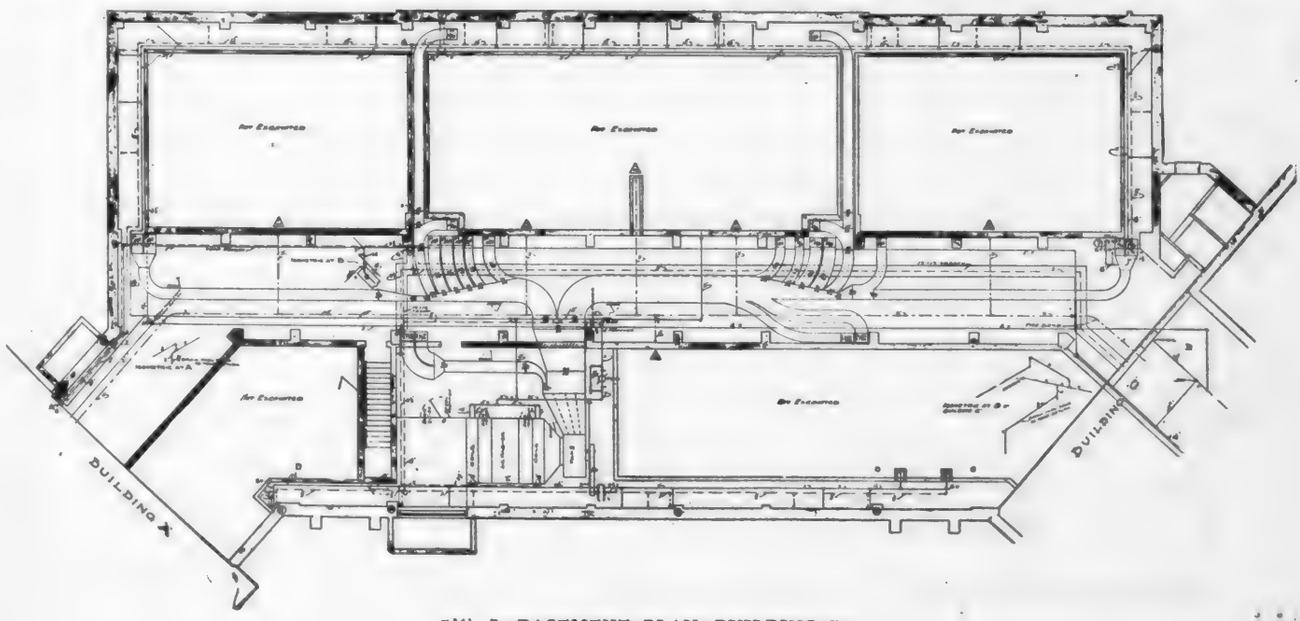


FIG. 7—BASEMENT PLAN, BUILDING B.

control for auditorium, lunch room and pool the Powers system being used throughout the entire system of buildings.

There are six ventilating units, five of these having in connection a Webster air washer. Also in connection with these air washers there is used a No. 14 regulator to control the temperature of the spray water for regulating the humidity in the air passing to the rooms throughout the buildings. A diaphragm valve is placed on the low-pressure steam line supplying steam to the heater in the pan of the washer and this is in turn controlled by the regulator which is acted upon by the temperature changes in the spray water.

The usual graduated thermostat is placed between the air washer and the re-heater coils which controls the diaphragm valves on the tempering coils; the air to the washer is controlled between 40° and 50°. Placed in the outlet of each fan unit are two Powers graduated extension thermostats which control one set of diaphragm valves on the steam supplies to the re-heater coils and maintain the air passing to the rooms at either 68° or 73°, according to the temperature of the outside air.

In the cold air supply of the fan units is placed a graduated thermostat set for 50° and by means of attachments on each switch-board the 68° thermostat is placed in action when the outside air goes above the 50° point. When the temperature falls below this point the 68° thermostat is cut out and the 73° thermostat is cut in action, the idea being that when the outside air is above 50° it is not necessary to have the air passing to the rooms above the 68° point, owing to the warmer outside air and the effect of the sun on the building. This makes it unnecessary for the engineer to make changes in adjustment as is necessary where a single thermostat is used. The above arrangement applies to Buildings A, B, D and E. In building C which supplies tempered and warm air for heating and ventilating the auditorium, a somewhat different arrangement is used.

There are three sets of coils; tempering, heating and re-heating coils, all controlled by Powers thermostats. One thermostat is placed between the air washer and heating coils to control the temperature of the air passing to the water sprays, one thermostat is placed beyond the heater coils to control the air at the outlet of the fan to 70°, while beyond this point are placed two sets of re-heater coils, one for the north and one for the south side of the auditorium, each side controlled independently. Just beyond each set of re-heater coils is placed a No. 10 regulator, controlling diaphragm valves on the steam supplies of the two sets, holding the air passing to the auditorium at 125°.

A plenum chamber is placed at this point, having double mixing dampers controlling the temperature of the air passing to the auditorium and the two sides of the balcony. The mixing dampers are controlled by four graduated thermostats, two in the main auditorium and two on the balcony.

SPECIAL ARRANGEMENT FOR LUNCH ROOM.

An entirely different arrangement is used for heating and ventilating of the lunch room. Along the north and south side of the room are placed radia-

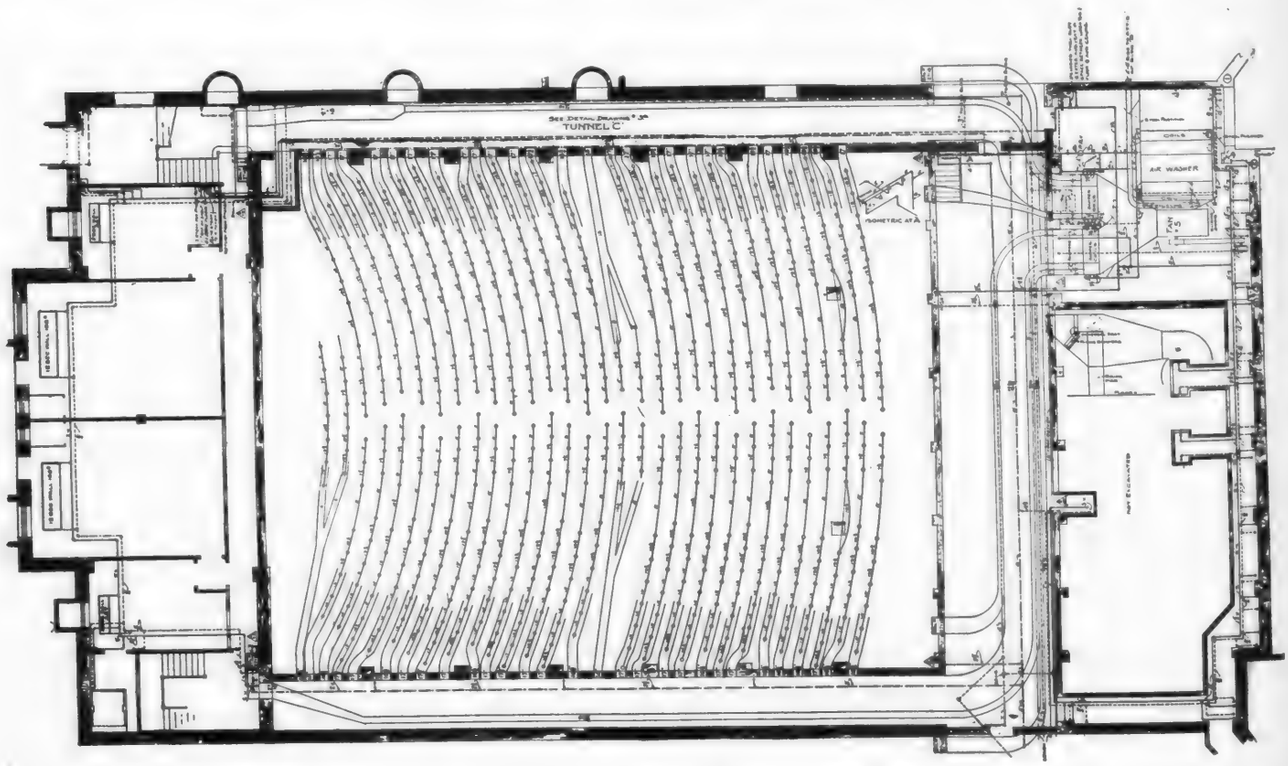


FIG. 8—BASEMENT PLAN, BUILDING C, SHOWING MUSHROOMS UNDER AUDITORIUM.

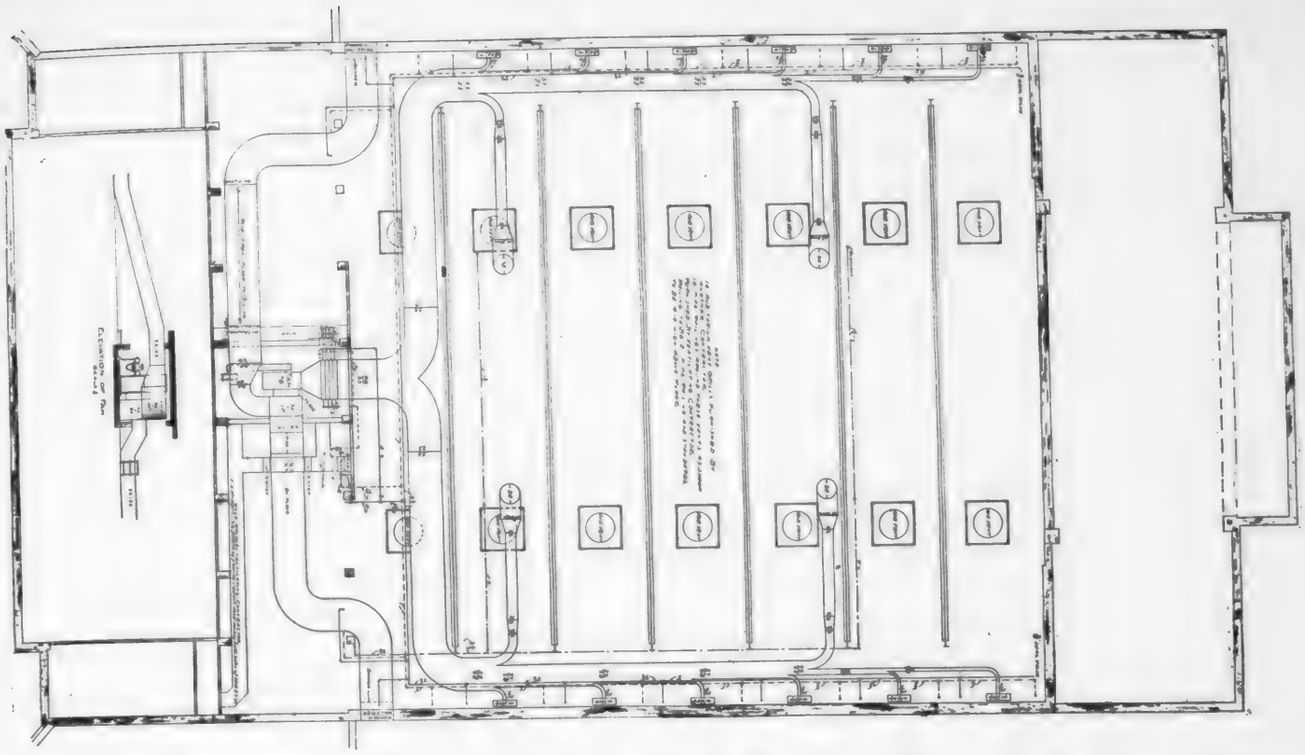


FIG. 9—PLAN OF SPACE BETWEEN AUDITORIUM CEILING AND LUNCH ROOM FLOOR, BUILDING C.

tors to which are attached diaphragm valves, those on the north side having stronger springs than those on the south side, the idea being that as they are controlled by a graduated thermostat the valves on the north side will close later than those on the south side.

In a central location in this lunch room is placed a compound thermostat. In the fan outlet of the ventilating unit is placed a thermostat controlling the coils on the tempering sections at 70°. The air from the fan is blown into the room through openings in the floor just under the radiators.

The compound thermostat located in this lunch room controls as follows:

The graduated part of the instrument will control the radiators at the point which it is set, but if the temperature should run above this point the positive action of the thermostat passes air at tank pressure, thus supplying air to the air supply side of the thermostat in the outlet of the fan. This, being set at 70°, will then supply air at 70° up through the floor openings under the radiators and the room will be held at the 70° point or any other at which the thermostat may be set. The idea here is that if at any time the temperature should from any cause fall below the setting point of the compound thermostat, the thermostat at the fan outlet will be cut out and the maximum capacity of the tempering coils will be exerted to bring the heat back to the operating point in the room.

PRECAUTION TO PREVENT AIR DAMPERS BEING LEFT OPEN AT NIGHT.

In the fresh air supplies, of which there are two, are placed dampers which are automatically closed when the fan is shut down and the steam cut off the coils. This is accomplished by means of a No. 10 thermostat placed close to the tempering coils. When the heat is turned into these coils the sensitive member of the instrument will expand and pass air to open the dampers and when the heat is cut off and the coils cool, this member will contract and release the air and allow them to close.

The reason for this arrangement is that this ventilating unit is located in a very inaccessible position, making it difficult for the engineer to manipulate manually-operated dampers. The idea is to prevent the fresh air dampers being left open at night.

Each building is fitted with a switchboard with switches, one for controlling the vent dampers lo-

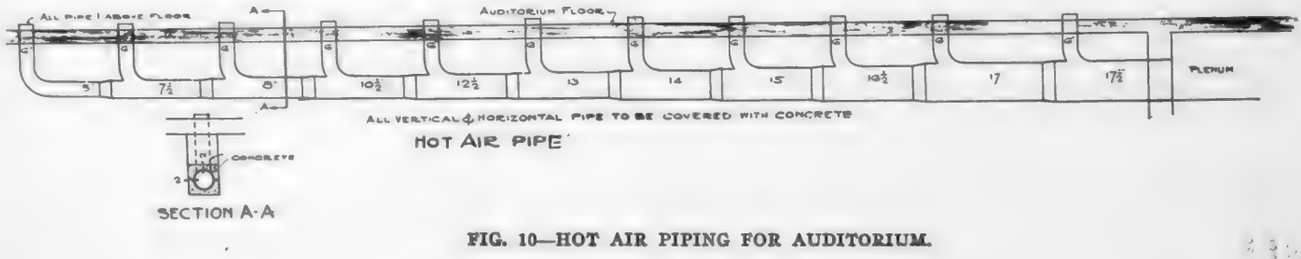


FIG. 10—HOT AIR PIPING FOR AUDITORIUM.

cated in the attic and a switch for each coil valve so that any valve may be cut in or cut out of action as may be desired, independent of thermostatic control.

At all thermostat locations there is placed a Powers 6-in. dial thermometer with large figures, thus making the readings possible at a distance.

The entire system is very complete and is unique

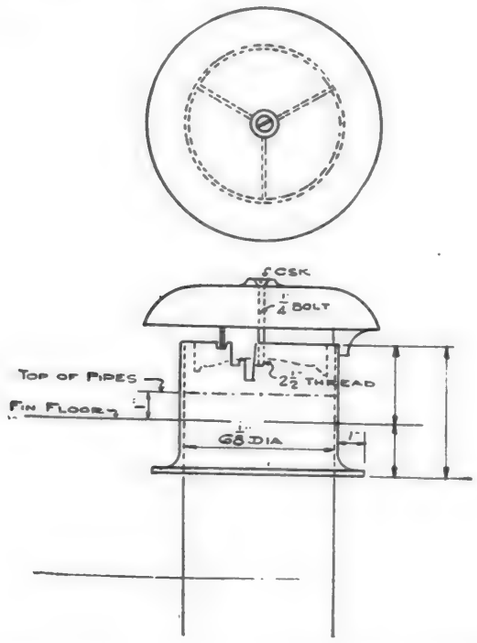


FIG. 11—MUSHROOM VENTILATORS FOR MAIN AUDITORIUM FLOOR.

in the double thermostat arrangement at the fan outlets, this being something entirely new, filling a long-felt want.

SWIMMING POOL CONTROL.

Each pool is fitted with a No. 14 B extension thermostat, with stem extending through the walls into a slot in the floor. This slot is covered by a perforated brass plate.

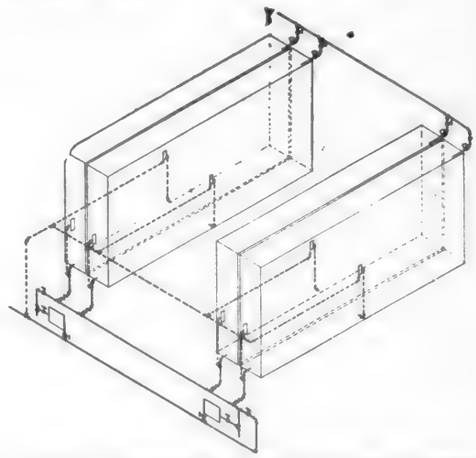


FIG. 12—TYPICAL ISOMETRIC FOR ALL COIL CONNECTIONS.

This thermostat controls an electric switch placed near the circulating pump pit, stopping the water circulating pump, when the water in the pool reaches the desired temperature and at the same time closing the steam supply valve on the pool heater.

These electric switches are placed upon a slate switchboard, upon which are also placed manually-operated air switches whereby the steam supply valves can be held open or shut as desired, regardless of the action of the pool regulator.

The East Side High School was designed under the direction of the Cincinnati Board of Education, C. W. Handman, business manager, and Charles F. Jordan, chief engineer. The installation was made by the Sodemann Heat & Power Co., St. Louis, Mo.

POSSIBILITIES IN THE USE OF STEAM FOR MELTING SNOW

Some Fundamental Considerations Frequently Overlooked in this Proposed Solution of the Problem.

By William J. Baldwin

AN unusual heavy snowfall during the past winter in various sections of the country, accompanied by long periods of freezing weather, created problems in snow removal from city streets which, in many instances, completely baffled the authorities. The mounds of snow which lined each side of the streets became solid masses of frozen slush, while the center of the roadways, due to the holes and ruts, assumed the appearance and character of mountain passes. Shoveling became out of the question and even the pick made little impression on the frozen masses.

The serious conditions led to a revival of the proposal to use steam in melting the snow, while other suggestions involved the use of fuel-oil heaters, similar to those employed in asphalt road-making. As far as steam is concerned, it is just as well to realize at the outset the limitations in this direction, as this solution of the problem is neither an easy one nor a cheap one.

THE ELEMENTS OF THE PROBLEM.

The accompanying diagram shows the problem as it may be applied to a city like New York. For an easy

understanding of the matter, we will take the heat required to melt a pound of snow or ice from 12° F. to water at 55° F., as the unit of melting for New York City. This requires 182 B. T. U. In colder climates the value of the unit will increase, as the snow or ice grows colder.

At the bottom of the diagram, starting at 20° F. below the freezing point, the units are marked 1, 2, 3, 4, 5, 6 and 7 and show, quite accurately, the greatest number of pounds of snow that can be melted with a pound weight of steam at atmospheric pressure, or at practically any steam pressure up to 140 lbs., and cooling the steam to water at 55° F., the reasonable sewer temperature, in winter, in New York City.

HIGH PRESSURE STEAM OF LITTLE ADVANTAGE.

It will be noted that as the steam advances in pressure the 7 unit, at the atmosphere line, becomes only about 7½ units at a pressure as high as 140 lbs; the diagram has been carried up to 140 lbs. only to show how slight the gain there is in high pressures. In practice, there will be little or no gain due to the greater condensation at higher pressures and the loss in applying the steam to the snow, unless by actual contact

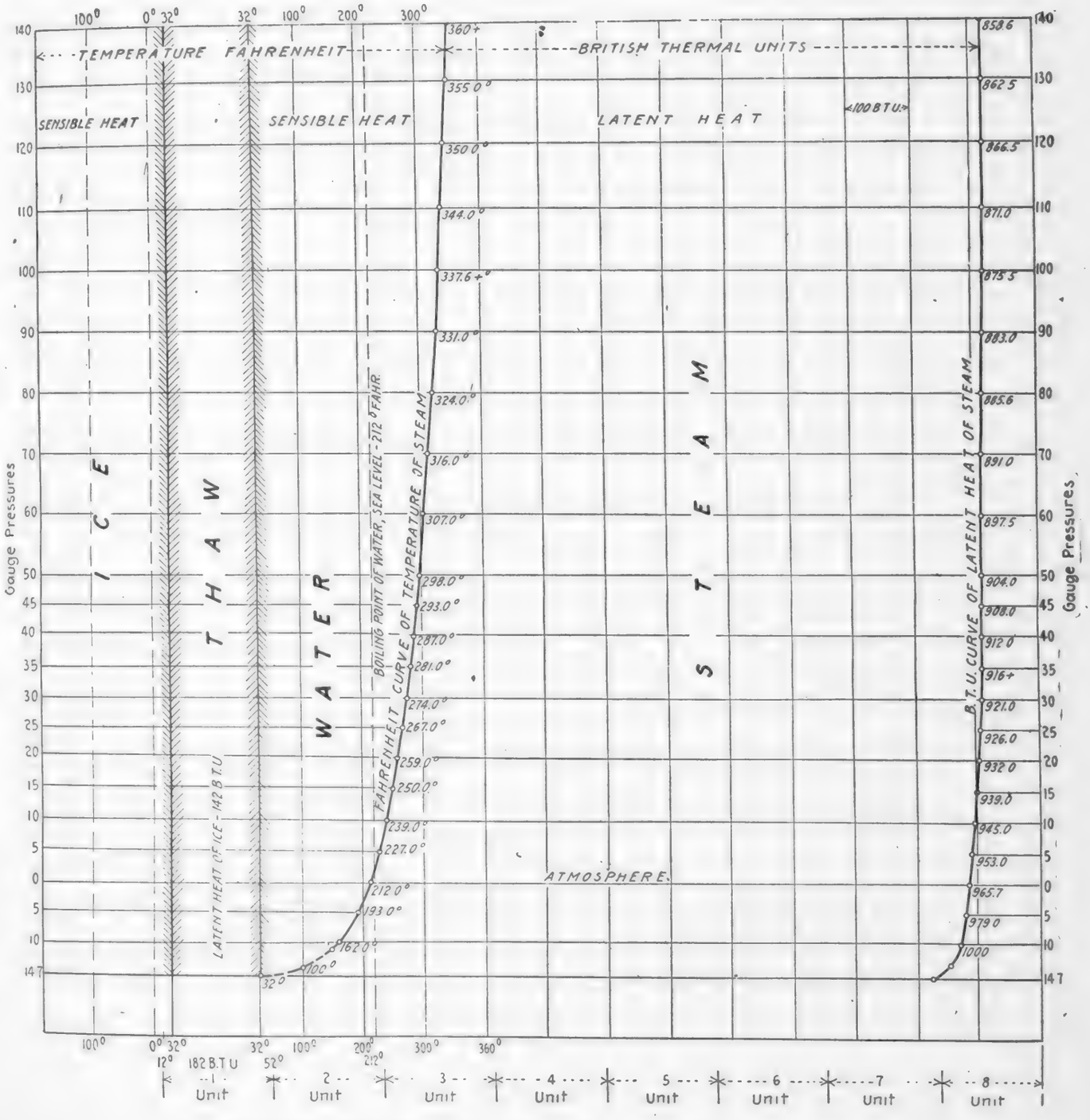


DIAGRAM SHOWING CAPACITY OF STEAM FOR MELTING ICE AND SNOW.

in a closed vessel. But, in any case, the gain or the loss is very little, and the diagram shows that only about 7½ lbs. of snow can be melted by one pound weight of steam, or the heat from a pound weight of steam, at any pressure. More than this cannot be done. It is the limit and very much less will be done by any method of "blowing," as with a steam hose into the atmosphere.

MUCH OF THE STEAM ABSORBED BY THE AIR

The air alone is generally capable of absorbing, in a very short time, all the steam that will come through the hose, and the only steam utilized in melting the snow, is the result of the momentary contact of the steam with the snow, just as the steam issues from the nozzle. For nozzle or steam-hose melting, low-pressure steam is more efficient—a little more—than high-pressure steam, as with low-pressure steam the refrigeration due to expansion at the nozzle is scarcely appreciable, while with high-pressure steam it is a considerable factor against success, because it takes place at the very nozzle, destroying or very much impairing the efficiency of the "hot contact" with the snow or ice.

The diagram is submitted as a contribution to the subject of snow or ice melting and makes it possible to estimate, at a glance, the weight of snow that can be melted by the burning of a pound of coal under a steam boiler. It is only necessary to assume (or know) how many pounds of steam can be evaporated from water at 55° F. in a steam boiler.

This evaporation can be taken at about 8 lbs. or less, depending upon the efficiency of the present-day coal burned under the boiler, so that by multiplying the units, as given in the chart, by the water evaporated per pound of coal (say, 8 lbs.) it supplies all the data necessary to establish the ultimate efficiency of a pound of coal in melting ice, assuming we get 100% efficiency in the melting process with an open pipe or hose. We cannot get a quarter of it, and we may not get one-tenth of it, so that it is safe to assume that for every pound of snow melted by steam hose we will burn 1 lb. of coal.

TANK METHOD OF MELTING SNOW SLOW AND TEDIOUS.

Melting snow in a tank will give pretty nearly 100% efficiency, but the process is slow and tedious. The time element and plant cost, will make it impracticable, if not impossible, even within any reasonable time limit. The real difficulty comes from the slow conducting power of the snow, or of the snow when it becomes half ice, even in a melting tank. This can be proved by shoveling a couple of hundred pounds of snow into an ordinary steam cooking kettle and noting how slowly it will melt.

The time element can also be readily established by the process of putting a kettle of snow on a stove. In this way the engineer can easily meet the doubts of those who assail him for not being more anxious to melt snow by steam in the streets or in a tank. There is no magic about it. Try it.

DIFFERENCE BETWEEN THEORY AND PRACTICE.

Briefly, then, we may say, that a pound of coal will make sufficient steam to melt 50 lbs. of ice, but we must have 100% efficiency in the process. Anyone who has had this problem in hand will understand why by an open-pipe method, such as that using a steam hose, not over 10% efficiency can be obtained, simply because the steam cannot be brought properly into contact with the snow without being dissipated into the atmosphere.

PROPOSAL TO USE FIRE ENGINES TO CLEAR STREETS OF SNOW.

This subject comes up regularly with each severe winter and nearly every new street cleaning commissioner has to meet it at least once during his administration. To those in authority, the question has its perplexities, as well as its funny aspects. A funny aspect of the case came up during the incumbency of "Alex" Williams in the office of police commissioner of the City of New York. Mr. Williams earned the sobriquet of "Clubber" Williams when captain of police because he advocated the use of the "night-

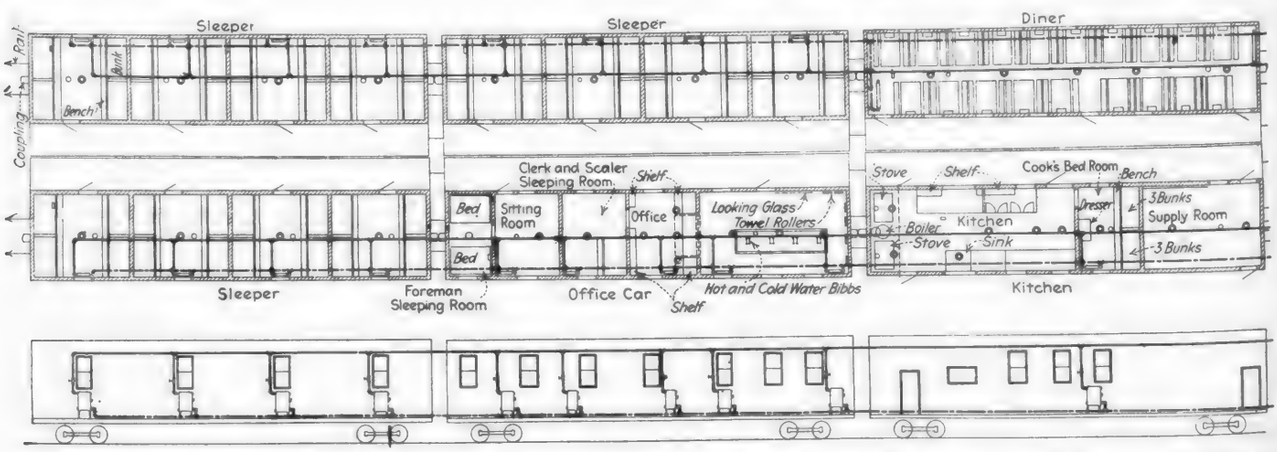


DIAGRAM OF 12 CAR TRAIN FORMING PORTABLE LUMBER APPLICATION OF CENTRALLY.

stick" by his men in dealing with the New York East Side gangs. When he was made street cleaning commissioner, he thought somewhat similar methods might prove effective in cleaning the streets of snow. This, by the way, was at about the time of the great blizzard of 1888.

Energetic he was, but he was neither an engineer nor a professor of thermal engineering, being by profession a shipwright, but he had common sense and when the *New York Sun* wanted to know why he did not order out the fire engine of the city to clear off a snowfall before the next day, he consulted a well-known steam engineer of those days. This engineer reported that the problem was "a large one" and that, according to the data submitted, it would require 90,000 tons of coal to melt that particular snowfall (and that only for the principal streets of Manhattan) while it would require all the fire engines of New York about three years, running day and night, to burn the 90,000 tons of coal. Incidentally, there would be about 20,000 tons of ashes to be removed by carts, and it was a question whether it would cost less to remove the snow or the ashes by carts. Needless to say, the fire engines were not ordered out.

Street Cleaning Commissioner George E. Waring tried the steam method. He used a steam tank plant, a stationary type, which was built at considerable expense, but it melted less than 100 tons of snow before it was discarded.

The question, in short, is one of the physics and is almost the reverse of ice-making. In fact, it is the reverse, except that in ice-making probably 95% of the coal value can be utilized, while in melting snow (or ice) in the streets, not 50% of the heat value of the steam can be depended upon with any means so far devised.

Atmospheric Heating System for Railroad Cars.

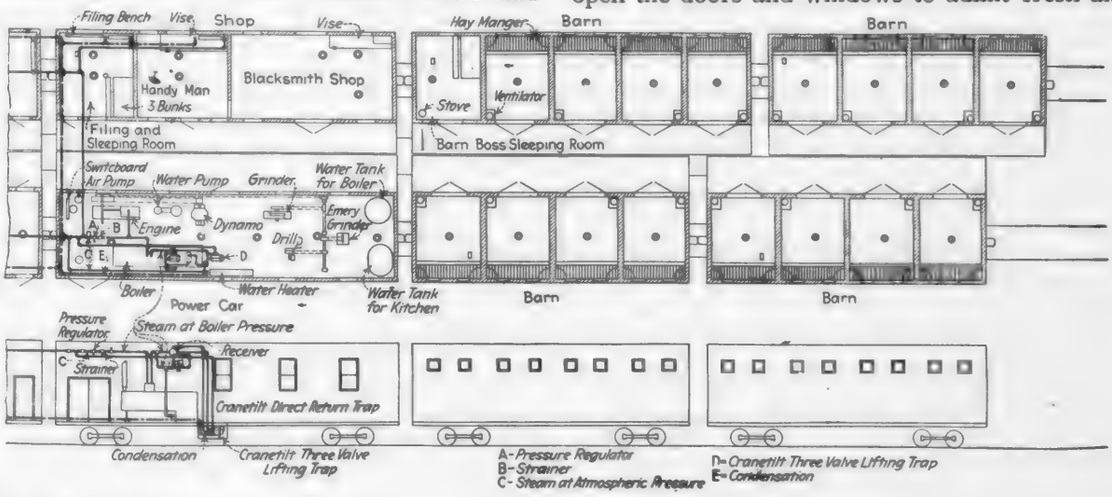
(From a paper by Thomas H. Ireland, presented at the recent annual meeting of the American Society of Heating and Ventilating Engineers.)

Mr. Ireland described a novel scheme which had been adopted in a Wisconsin lumber camp for housing the workers in comfortable quarters. A train of twelve railroad cars was used, especially designed and built by the mechanical department of the company operating the camp, the Park Falls Lumber Company. The cars were arranged as shown in the illustration, the power car containing the boiler, engine, electric lighting system, hot and cold water systems and the atmospheric heating system. The fact that the temperature in the vicinity of Park Falls goes down to 40° F. below zero shows how important it is to make provision for taking good care of these men.

The scarcity of water made it necessary to return the condensation to the boiler which, by the way, was fired by wood. On this account an atmospheric heating system was used, with a steam trap for the return of condensation.

The boiler used, of the locomotive firebox type, maintains an average steam pressure of 125 lbs. gauge. Steam flows through a Crane pressure regulator into a 2-in. pipe, having its pressure reduced from 125 lbs. to 1 lb. gauge at the regulator. There are seven cars heated with steam. Each car is fitted with American Radiator Company water-pattern two-column 38-in. radiators, set on extension legs having the condensation outlet 16 in. above the car floor. The cars heated with the Crane-tilt trap atmospheric heating system are the kitchen, office, three sleepers, dining and shop cars. There is a 2-in. pipe suspended from the ceiling of each car which is used to supply the steam to the radiators. The connection from one car to another is made with a section of steam hose and two Crane railroad unions. There is a 1 1/4-in. pipe suspended from the radiator extension legs and the wall in each car which receives the condensation from the radiators. Each radiator is fitted with a Hoffman air valve.

The lumber jack gets very wet out in the woods at times and the moisture from both perspiration and the weather contribute to form odors which make ventilation imperative. This is accomplished by suitable ventilating devices that do not make it necessary to open the doors and windows to admit fresh air.



CAMP OF PARK FALLS LUMBER CO. SHOWING OPERATED STEAM HEATING SYSTEM.

The Heating and Ventilating Magazine
A MONTHLY JOURNAL of ENGINEERING PROGRESS
Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 17 April 1920 No. 4

Published Monthly at Cooperstown, New York, by the
HEATING AND VENTILATING MAGAZINE COMPANY
Executive and Editorial Offices
1123 Broadway, New York
A. S. ARMAGNAC . . . . . President and Editor
GUSTAVE PETERSEN, Secretary-Treasurer and Business Manager
European Representative
W. G. HOLLINGWORTH, 304 High Holborn, London, W. C.

Subscription	$2.00 per year
Canada	2.25 per year
Foreign Countries	2.50 per year
Back numbers	25 cents each

IT GOES without saying that the function of a trade journal is to be of the greatest usefulness to its readers, as well as to its advertisers. The question is, how may that usefulness be made most effective? Do the readers, as well as the publishers, get the most use possible out of it?

A journal like THE HEATING AND VENTILATING MAGAZINE has two general classes of readers, the man who designs and installs the work, and the manufacturer. Speaking from the standpoint of the engineer, it is surprising how few, relatively, take advantage of their opportunity to obtain through their trade journal information on almost any subject connected with their work. In many cases, probably, they do not know the extent of the fund of information at the command of the editors, or, as we sometimes suspect, they may be diffident for fear of exposing their lack of knowledge on a given point. Or it may be that they feel their inquiries would be unwelcome in putting the editors to undue trouble for what they feel is, after all, a gratuitous service.

The fact is, however, that every responsible trade journal welcomes requests for help and opportunities for discussion and will gladly go to great lengths to meet the requests in an adequate manner. It is not alone the inquirer who benefits by such effort. More often than not, a large percentage of the readers is glad to read such correspondence and gains many points that previously may have been only indistinctly understood. This does not mean that the trade journal expects to be considered as the final authority on any subject, but the fact remains that it usually has sources of information that are valuable and should not be overlooked.

The columns of the trade journal offer similar opportunities to the manufacturer, except that, in his case, it is the opportunity of presenting information for the benefit of the reader. We are not referring now to the old-time "puff" or "write-up" which has long since outlived its day. But every manufacturer has a wealth of data and practical information to give out regarding his product and, as a class, he seems not to be aware of the availability of such matter for the trade journal in his field.

We are hearing a good deal of co-operation just now in the business world and we suggest this line as one that can be followed up with great profit by reader and manufacturer alike. Use your trade journal. Let us offer a solution of that problem that has been confronting you or if you have something interesting, either new or old, pass it along to the trade through our columns. If a manufacturer, bear in mind that your trade journal will welcome engineering data and news items concerning your product, the only requisites being that such matter is new, interesting and accurate.

THE PASSING of Andrew G. Paul recalls a name that will always be associated with the greatest single advance ever made in the art of steam heating. The Paul system of vacuum steam heating, or the "Paul System," as it is universally known, was the forerunner of all of the present systems of vacuum heating and for years enjoyed a pre-eminence that was unique and, incidentally, made a fortune for its inventor. It is one of the ironies of life that Mr. Paul, nevertheless, died a poor man.

Like so many other epoch-making discoveries, the idea of exhausting the air from a steam heating system by mechanical means did not originate with Mr. Paul. As a matter of fact, he saw the scheme being tried as a makeshift on a skylight coil that had been giving trouble, due to air binding. W. P. Skiffington, with whom Mr. Paul was then associated in the Fairbanks Company, conceived the idea of connecting an air pump to the air valve on the coil and from that minute the coil heated perfectly. With a quick perception of the possibilities in this arrangement, Mr. Paul urged Mr. Skiffington to secure a patent on the principle involved, which was done, a three-quarters interest being assigned to Mr. Paul.

The history of vacuum steam heating from that day forward has been largely a history of the Paul principle. Other manufacturers produced modifications of the system, but it is stated that the basic ideas involved in the Paul patents were never successfully assailed in court. His income from royalties alone on the patent are estimated at over $1,000,000.

Mr. Paul himself was scarcely known to the present generation. Old-timers, however, will recall him as an engaging character, hospitable and generous to a fault, whose honors rested lightly upon him even in the heydey of his career. Viewed in the light of engineering history, his contribution to the art of heating has left an indelible mark which will remain as long as steam is used as a heating medium.

WRINKLES

Design Of Discharge Outlets And Diffusers in Fan Blast Heating Of Shops.

In heating by fan blast, velocities at the discharge outlets in shops may be somewhat higher than in other buildings and it is, therefore, important that the air be given the proper control, diffusion and direction. The air should be admitted and discharged near the floor, since heat and ventilation are required in the occupied zone.

How the transformations are made from round or rectangular ducts to grille outlet is shown in the sketches. In Fig. 1, deflectors are installed to eliminate unequal velocities at various parts of the grille. These are bent into position until the proper equalization of discharge over the grille is obtained, while in

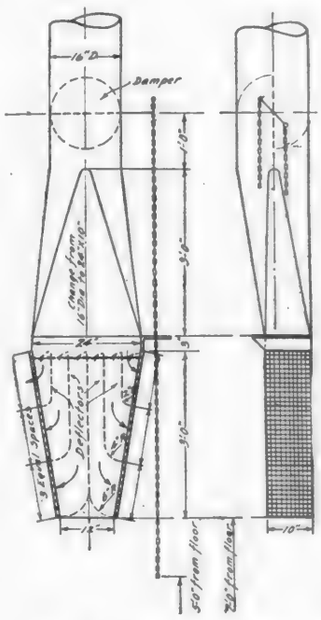


FIG. 1—ARRANGEMENT OF DROP PIPES WITH INTERNAL DIFFUSERS.

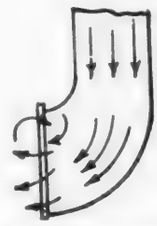


FIG. 4—DROP PIPE WITHOUT DIFFUSERS SHOWING RESULTING EDDIES AT REGISTER FACE.

Fig. 2 deflectors with indicating quadrants are used at division points. Volume or butterfly dampers are also used, and as these are required to be operated at various times and are of necessity located beyond ordinary height, they are connected by chain for operation from floor.

Figs. 2 and 3 show how the air may be directed diagonally or lengthwise of the building instead of across, as is more usually done (see Fig. 1). In all three cases, the vertical flues are carried downward along the columns in the centre of the building to within 7 ft. from the floor, the discharge being downward at a slight angle in two directions; toward the outside walls.

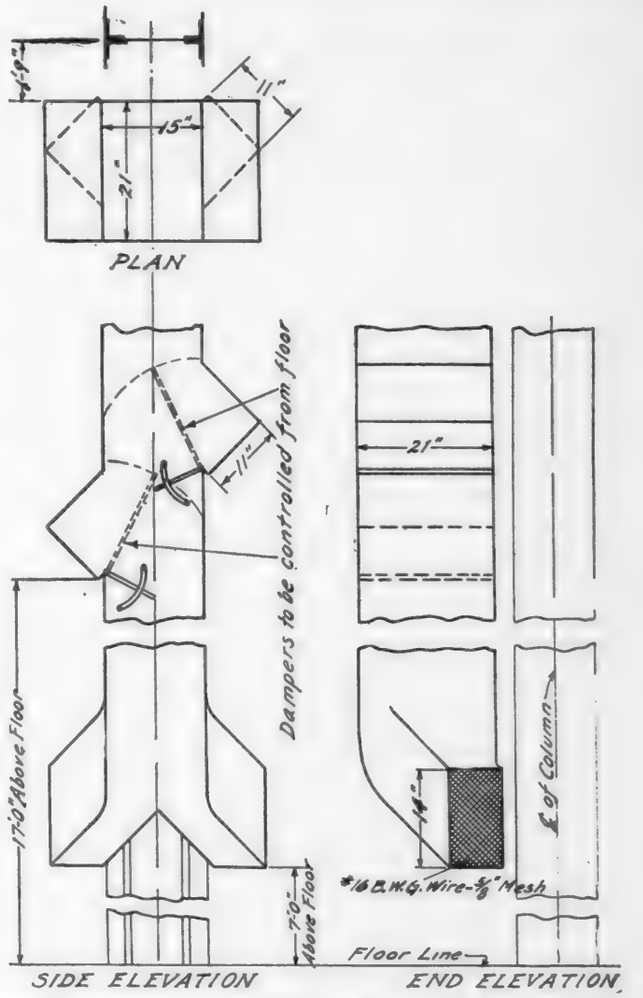


FIG. 2—ARRANGEMENT OF DROP PIPES ALONG CENTER COLUMNS.

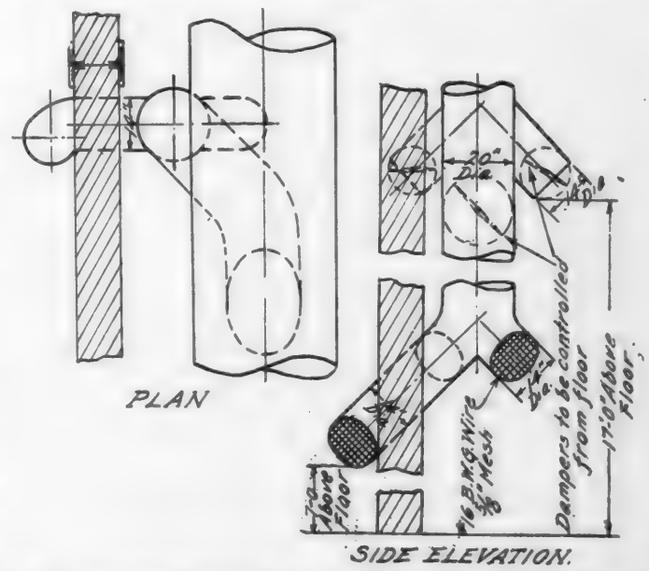


FIG. 3—ARRANGEMENT OF DROP PIPES ALONG WALL.

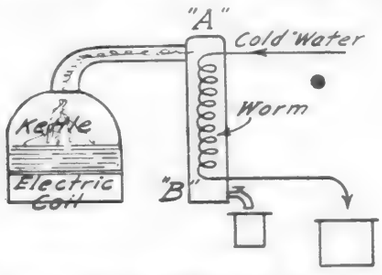
Fig. 3 shows how the upper levels may be supplied with a stratum of warm air. By means of dampers, either upper or lower discharge may be obtained or both used in combination. The dotted lines indicate the method to be followed when the flue is at one side of a room and when it is also desired that air be supplied to an adjacent room.

The necessity for deflectors where flues abruptly turn at right angles to the discharge outlet is indicated in Fig. 1. This produces a uniform velocity at the grille, as shown by the arrows. Without such devices as these, the air would travel as shown in Fig. 4, leaving at the bottom with high velocity and creating eddies or return of the air at the top, as indicated by arrows. In this way the entire volume is discharged in a thinner and chilling stream over the occupants, and if deflectors or diffusers are not used, then lower velocities must be employed.

Circulation Of Water Against The Flow Of Steam.

In heating or distilling water, it is advisable to arrange connections so that the temperature difference and the amount of condensation are uniform throughout the tubing, coils or other heating device. Occasionally a method of heating water is adopted which fails to take into account the fact that the hottest water must surround the tubes containing the hottest steam while the cold water must circulate over the colder tubes.

In illustration of this principle, if water be distilled by circulating cold water through a worm coil



DISTILLING WATER BY WORM AND KETTLE, SHOWING WRONG CONNECTIONS.

over which steam from a kettle is condensed, it will be found that the method shown in Fig. 1, will result in less distillate than when the flow of cold water is reversed to that as shown. The coldest water and hottest steam are at point "A," therefore the temperature difference is much greater than at "B" wherein the hottest water and coldest steam are adjacent. In other words, the time factor enters into the situation so that, with the connections as shown, the coil is not working at its maximum capacity. The condensation per foot of coil is not at a uniform rate.

How To Get The Most Heat Out Of A Radiator.

In the use of radiation, as in other phases of the work of the heating and ventilating engineer, resourcefulness and ingenuity, as well as careful thought, are absolutely essential. While the meeting of the heating requirements is the first essential, the harmonious arrangement of the radiation must be given due thought. Care must be used to see that the space available is sufficient for the radiation, or that the type of radiation selected will best fit the space available. In no case should a radiator placed under a window exceed in height the window sill. The latter, together with the limitations of space, usually govern in the selection of radiators, but a certain relation should be maintained, where possible, between the height and length in order to give a symmetrical appearance.

To obtain the maximum of heating from direct radiation, there are certain factors which must be taken into consideration, such as the kind of material used (whether of cast-iron or wrought-iron), the

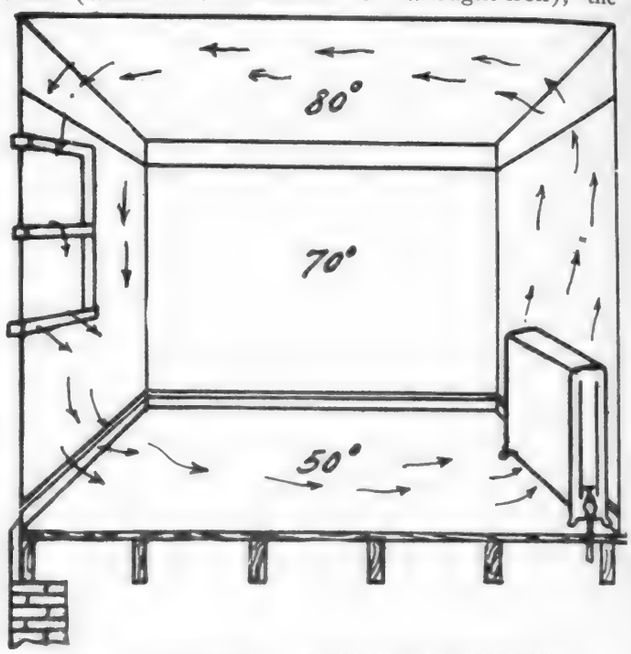


FIG. 1—INCORRECT LOCATION FOR RADIATOR.

painting or bronzing of the surfaces and the arrangement of these according to number of columns and height.

The location of radiators, as recessed, and with radiation of the wall type, whether installed in a horizontal or vertical plane or at the ceiling, are all matters which affect the results, but most important is the location of the radiator with respect to the windows and other exposed or cooling surfaces.

BEST PRACTICE TO LOCATE RADIATORS NEAR OUTSIDE WALLS.

The proper location for radiators is close to the coldest walls and under the windows where possible and so arranged that all cold currents of air must first be warmed by these surfaces before striking the body. They should be set at a sufficient distance from the wall to allow a free circulation of air around them, the most efficient radiation being that whose surfaces are exposed to the coldest currents of air.

What actually takes place, in accordance with the location of radiating surfaces, is indicated in Figs. 1

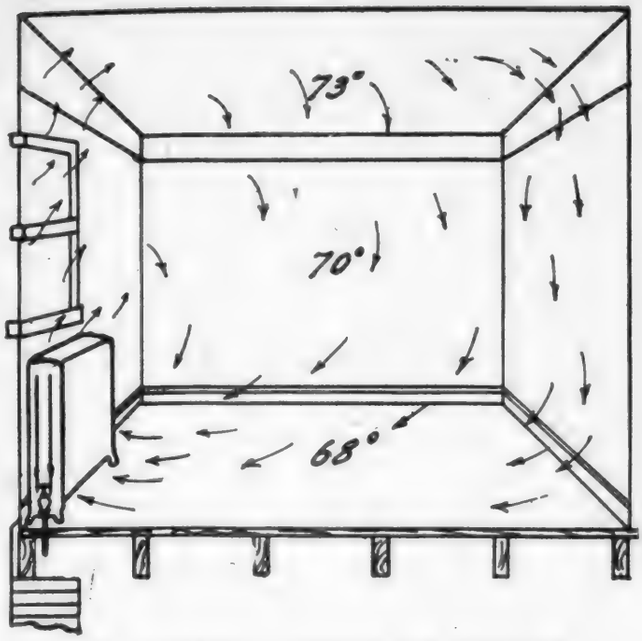


FIG. 2—CORRECT LOCATION FOR RADIATOR.

and 2. In Fig. 1, the cold air from the glass lowers to the floor along which it is drawn by the upward heated currents from the radiator, and mingling with these, rises, as shown by the arrows, until contact with the cold window surfaces causes it to lower again and the circuit is complete. Such an arrangement is undesirable, since the floors are usually cold and but little air movement takes place in the centre of the room.

In Fig. 2, the conditions are changed. The radiator is placed at the window, as it should be, while the warm upward currents form a blanket against the cooling surfaces and a circulation which is broken up so as to traverse the entire space to be heated. In the first figure there is a difference in temperature of 30° between the floor and ceiling, a difference which is decreased to 5° by locating the radiator as shown in the second figure.

USUAL FIGURES FOR EMISSION OF HEAT FROM RADIATORS.

A water radiator gives off 150 heat units per square foot per hour while a steam radiator gives off 250 heat units. These figures are calculated for standard conditions of room temperature of 70° F., an assumed average temperature of the water in the radiator of 170°, and with steam temperature of 220° corresponding to pressure of about 3 lbs.; however, they are only general, for the exact amount of heat given off varies with the form of the radiator. For instance, a single-column 22-in. high steam radiator will give off 285 heat units per square foot per hour, while a four-column 38-in. radiator will give off 218 heat units per hour, a difference of 30%. To work properly, the exact type and form of the radiator should be determined, and the efficiency of the particular radiator selected used as a basis for determining the amount of radiation required.

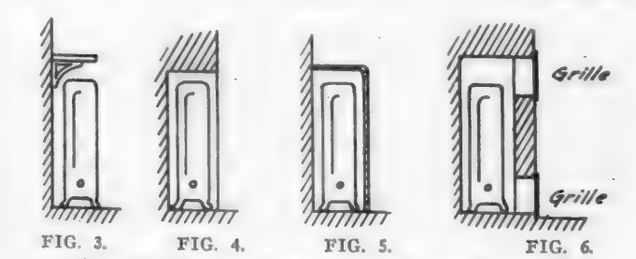


FIG. 3. FIG. 4. FIG. 5. FIG. 6.

VARIOUS TYPES OF RADIATOR ENCLOSURES.

Fig. 3—Flat Shelf. Fig. 4—In Open Recess. Fig. 5—Encased With Grill. Fig.6—Entirely Closed, Grille Top and Bottom.

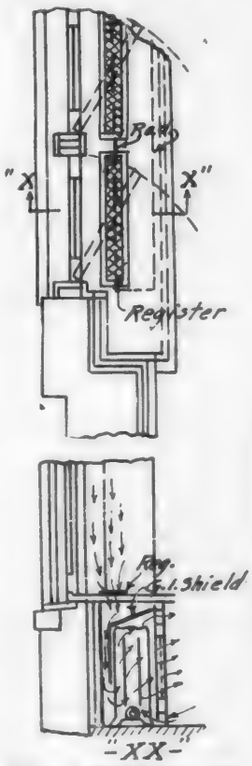


FIG. 7—METHOD OF ENCLOSING RADIATORS TO DECREASE LOSS IN EFFICIENCY

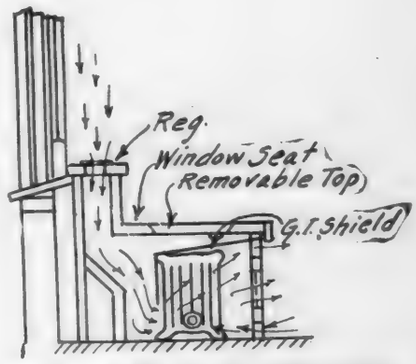


FIG. 8—METHOD OF INSTALLING RADIATOR UNDER WINDOW SEAT TO DECREASE LOSS IN EFFICIENCY.

METHODS OF CONCEALING DIRECT RADIATORS.

In residences and public buildings, direct radiators are sometimes concealed in enclosures. While this is desirable for esthetic reasons, it lessens the efficiency of the radiators so that an increased amount of radiation must be installed to offset this decrease in efficiency. The extent to which this radiation must be increased depends entirely upon the construction of the radiator enclosure. As a general rule, a concealed radiator must be 20% to 40% larger than an exposed radiator to do the same work. The smaller increase would apply to cases where ample air inlet and outlet were provided, and the larger increase to cases where the air spaces were restricted. The amount of increase in radiation is given by C. A. Fuller for the various conditions shown in Figs. 3, 4, 5 and 6, as 10, 15, 20 and 25% respectively.

CONSTRUCTION OF RADIATOR ENCLOSURES.

In the construction of radiator enclosures, a space 2½ in. deep in front and rear of the radiator has been

found to be most efficient. The air should travel over the radiator at a maximum velocity and as nearly uniformly as possible over the entire length of the radiator. Shelves, as in Fig. 3, have a greater effect on low radiators than on high ones, by an amount which is dependent upon the distance from the shelf to the top of the radiator. The length of the inlet and outlet screens should be the same as the length of the radiators within the enclosures.

In May, 1918, a correspondent of THE HEATING AND VENTILATING MAGAZINE suggested two kinds of enclosures which he had used for radiators and by means of which the usual loss in efficiency was decreased to a considerable extent. In the first, as shown by Fig. 7, there is a natural tendency for the cold air against the window glass to drop, in particular as facilitated by the radiator action, instead of being counteracted by the upward hot air flow from the radiator. The air thus striking the radiator direct from the cooling surface of the window is likely to be much cooler in temperature than air circulating around the floor of the room from which the ordinary radiator draws its supply. Where a small window radiator is used with a low seat, the seat, is provided with a flash cover, arranged as shown in Fig. 8. The same theory of operation follows here as in the first case illustrated and the results obtained are about the same.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.

XXI—THE STERLING VAPOR SYSTEM.

Although following, in a general way, the accepted practice in the design of vapor heating apparatus, the Sterling system, manufactured by the Sterling Engineering Co., Milwaukee, Wis., has some characteristic features which distinguish it from other types. One of these is the air eliminator, shown in Fig. 4 and another the alternate receiver and air separator, used on larger installations, shown in Fig. 5. The diaphragm radiator trap used with this system is also of unique construction.

The boilers, radiators, pipe and fittings are the same as those used on other types of systems. The return pipe from the radiators, however, is connected into a general return main on which an air eliminator is installed; it is open to the atmosphere until all the radiators are full of vapor. This, of course, permits the vapor to flow into the pipes and radiators without resistance, immediately filling the entire system with vapor to the point where the thermostatic trap is installed on the bottom of the radiator. When the vapor reaches this point it comes in contact with the diaphragm in the miniature trap installed on each radiator. The operation then follows the usual course, the vapor causing the volatile liquid to expand, preventing the escape of vapor from the radiator.

As the vapor condenses and as the system is now automatically closed a natural vacuum is created in the system which automatically draws the air from the boiler and pipes, discharging it to the return line, and thus providing an unrestricted circulation of vapor.

As the vapor in the radiator condenses, it cools the diaphragm in the thermostatic trap, causing it to contract and thus permitting the water and air to escape into the return pipe. The radiator thus relieved of air and condensation immediately refills with vapor until it again reaches the diaphragm in the trap.

The air and water are carried in the return pipe to the basement, the air from the system being discharged to the atmosphere through the automatic air eliminator, and the water or condensation being returned to the boiler. Means are taken through the use of an automatic vapor damper regulator (Fig. 6) to keep the vapor in the boiler at a uniform pressure and the graduated supply valve on each radiator (Fig. 1) places the room temperature under the control of the occupant. These supply valves are of the packless quick-opening type. They have the desirable feature that the tension between the packless disc and the stem can be regulated by loosening or tightening the screw in the top of the handle. The valve can be easily taken apart.

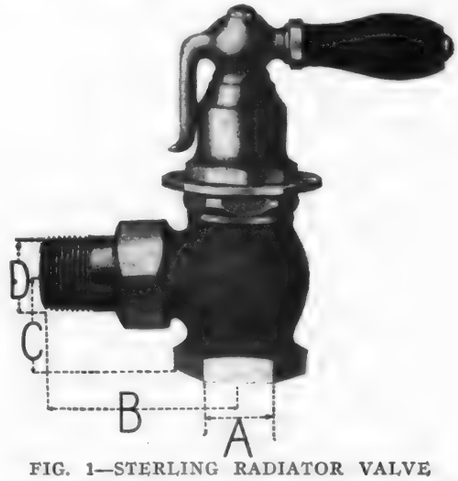


FIG. 1—STERLING RADIATOR VALVE

Special attention is called by the manufacturers to the construction of the Sterling diaphragm radiator trap used with this system. It is pointed out that the diaphragm cannot collapse from pressure and that it has a continuous, rather than an intermittent, discharge. It also has a vertical self-cleaning seat, while the diaphragm is concave, assuring flexibility.

A unique feature of the Sterling thermostatic trap is the adjustment device by which the position of the diaphragm in relation to the seat can be regulated without removing the trap from the radiator or disconnecting it from the return line. By means of this adjustment, the diaphragm can be set in the proper position with the steam turned on and thus an accurate adjustment made. After once set in place, the lock screw is turned down against the end of the diaphragm stem, preventing the diaphragm from getting out of adjustment. The adjustment is covered by a washer and name plate which are held in place by a threaded ring in the top of the cover, thus hiding the adjustment from the eye and preventing same from being tampered with.

Regarding the air eliminator used, this should be placed at least 30 in. above the water-line of the boiler. It is a self-contained unit and has a check to prevent outside air from being drawn into the system.

The Sterling alternate receiver, used on large vapor installations or where the distance between the water level in the boiler and the level of the return line at the boiler is less than 30 in., is an ingenious device, designed to return the water to the boiler against pressure. Special care has been taken in its design to prevent dirt lodging on the seat of the valves and preventing proper closing.

The valve in the Sterling alternator and air separ-

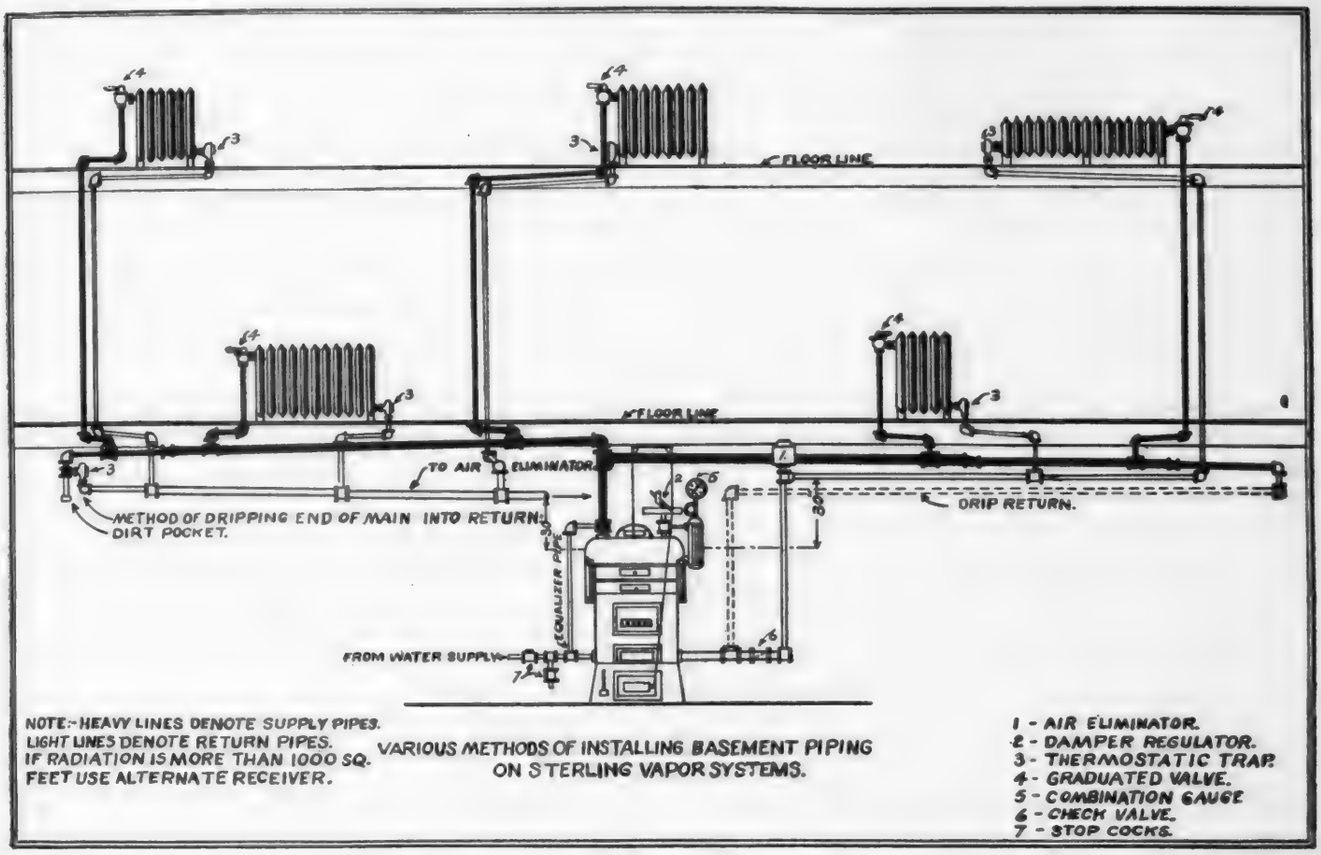

FLOOR LINE
TO AIR ELIMINATOR
METHOD OF DRIPPING END OF MAIN INTO RETURN
DIRT POCKET.
DRIP RETURN.
EQUALIZER PIPE
FROM WATER SUPPLY
NOTE:-HEAVY LINES DENOTE SUPPLY PIPES.
LIGHT LINES DENOTE RETURN PIPES.
IF RADIATION IS MORE THAN 1000 SQ. FEET USE ALTERNATE RECEIVER.
VARIOUS METHODS OF INSTALLING BASEMENT PIPING ON STERLING VAPOR SYSTEMS.
1 - AIR ELIMINATOR.
2 - DAMPER REGULATOR.
3 - THERMOSTATIC TRAP.
4 - GRADUATED VALVE.
5 - COMBINATION GAUGE
6 - CHECK VALVE.
7 - STOP COCKS.

FIG 2—TYPICAL LAYOUT OF STERLING VAPOR HEATING SYSTEM.

ROUGHING-IN DIMENSIONS OF STERLING VALVES AND TRAPS.

No. of Valve	A	B	C	D	Capacity
A	¾	2⅜	1¼	½	Up to 70 ft.
B	1	2¾	1⅜	¾	70 to 150 ft.
C	1¼	3¼	1⅝	1	150 to 225 ft.
No. of Trap	**A**	**B**	**C**	**D**	**Capacity**
1	½	2⅜	1¾		Up to 75 ft.
2	½	2¼	1⅞		75 to 200 ft.
3	¾	2⅝	2½		200 to 500 ft.

NOTE—The above measurements are given in inches, capacities in square feet of radiation. For radiators 20 in. and lower in height and long radiators on coils use valve one size larger.

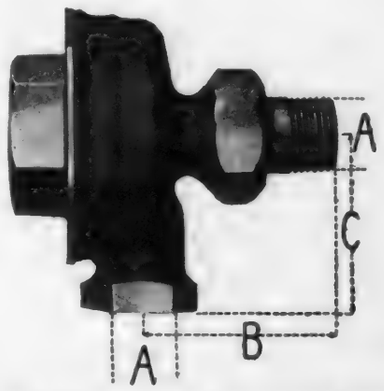


FIG. 3—STERLING RADIATOR TRAP.

ator never leaves its seat. It is of the slide-valve type and as the trap or receiver fills and discharges, thus raising and lowering the float, the slide valve moves forward and backward over the steam and exhaust ports, first allowing the air from the system to

FIG. 4—AIR ELIMINATOR.

escape to the atmosphere, as the receiver fills, and then admitting steam from the boiler, when the receiver is full. This places the receiver under boiler pressure and causes the condensation to return to the boiler by gravity. The level of the outlet of the receiver can be within 6 in. of the water-level of the boiler.

The accompanying diagram shows the proper way to connect the Sterling alternator and air separator. This device, it is stated, can be used in many industrial plants, as well as in heating systems, to return water against pressure without the use of a pump, or to raise water to higher levels, when steam pressure is available.

The Sterling alternate receiver and air separator is for use especially on large installations or where it is not practical to use the air eliminator, owing to lack of space to install the air eliminator 30 in. above the water-line. The alternate receiver can be placed as low as 6 in. above the boiler water-line, as there is no relation between the pressure carried on the boiler and on the return main when this receiver is used. It is

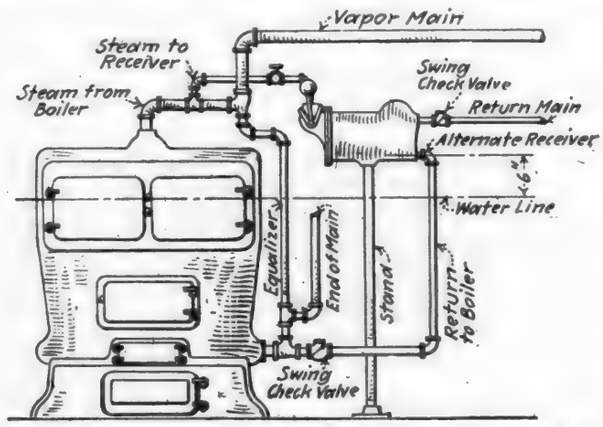


FIG. 5—PROPER METHOD OF CONNECTING STERLING ALTERNATOR AND AIR SEPARATOR.

described as capable of draining the system thoroughly, eliminating the air without loss of vapor and discharging the condensation to the boiler, regardless of the pressure carried, up to 25 lbs. It also prevents air from being drawn into the system and makes an excellent return trap.

INSTRUCTIONS FOR INSTALLING.

In installing this system, the manufacturers recommend that the air return line be started as high as possible, the first line which is farthest from the boiler being located near the ceiling, or up between the joists. It should not be less than ¾-in. in size. It is good practice to arrange this main so that it pitches in the same direction as the main vapor line, depending on how high the main air return line is started.

This line can be arranged in two or more circuits and run on a gradual pitch toward the boiler of at least ½-in. in 10 ft. The height of this line where receiver and air separator connects to it should be not less than 30 in. above the boiler water-line. As already stated, on large installations the use of the Sterling alternate receiver is recommended, placed 6 in. above the water-line.

All vapor outlets or risers from the boiler dome to the vapor main should be connected their full area. It has been found good practice to use not less than two outlets full size of opening and then connect them into a header with an equalizing pipe, with a reducing ell looking down and connected to the boiler below the water-line (Fig. 2). The size of this drop-line should be about as follows: Up to 500 sq. ft. radiation, 1 ¼-in.; up to 800 sq. ft. 1 ½-in.; up to 2500 sq. ft., 2-in.; up to 6000 sq. ft., 2 ½-in.; up to 10,000 sq. ft., 3-in.

FIG. 6—DAMPER REGULATOR.

The main vapor line, taken from top of header on boiler, should have a gradual pitch in the direction away from the boiler of a fall of ½-in. in 10 ft. The laterals or branch pipes from the main vapor line in the basement should be taken off the main from the top of the line, with a nipple and ell or nipple and 45° ell, and should be run one size larger than the riser. They should have a pitch back to the vapor main of 2 in. in 10 ft. If the riser is a great distance from the main the laterals or branches should be two sizes larger, or possibly this line could pitch away from the vapor main and near the end a drip could be run to a point below the boiler water-level.

For the laterals or branch pipes which are run between floors or under the ceiling, which should also have a pitch of 2 in. in 10 ft., it is recommended that they should be securely nailed and braced so that there will be no traps for the water to lodge. Also, when running the mains in the basement, it is advisable to run two or

more circuits and to arrange these circuits so that they meet at a point not less than 18 in. above the boiler water-line. From this lowest point, a bleeder pipe should be run connecting to the return inlet of the boiler or into the main return line below the water-line.

Some interesting points are offered by the manufacturers in connection with improper operation:

If radiators do not heat through quickly before 1 lb. of pressure shows on gauge, look first to see if the safety valve in air separator and receiving tank is open, because dirt and grease in a new system is liable to cause the valve to stick.

Look for faulty piping, see that there are no drops sags or pockets or stoppages.

See that the regulator works properly. Connect it so that it will operate on a few ounces arranging dampers so that when draft damper is closed the check damper will commence to open and when check damper is closed the draft damper will commence to open.

Keep a good clean fire, from ashes and clinkers. A deep bed of fuel must be maintained in the fire pot.

Make sure the boiler furnishes enough vapor in the regular way with all radiators open.

Examine flue to determine its area and velocity of draft.

See that boiler flues are cemented according to instructions.

Make sure that extreme end of vapor main is not less than 18 in. above water-line of boiler and inlet to receiver and air separator is 30 in. above boiler water-level.

Level branches from mains to risers and from risers to radiators and note carefully if they have a generous pitch in the right direction.

LEGAL DECISIONS

Contractor's Right to Rescind Contract for Installing Heating and Ventilating System on Prevention of Performance by Owner.

Action was brought by a New Jersey Board of Education to recover damages for the breach of a written contract against a heating and ventilating contractor, for failure to install a steam heating and ventilating apparatus in a school building about to be constructed. The contractor filed a counterclaim, demanding $500 profit on the work on account of the Board's failure to complete its part of the work within the time specified in the contract. The trial gave judgment for the Board on the contractor's counterclaim on the ground that, as the contractor did not perform his part of the contract, he could not recover profits thereon.

From this determination the contractor did not appeal. On the Board's claim, however, there was a judgment in favor of the contractor, on the ground that the Board allowed itself to be placed in such a position that it prevented the contractor from fulfilling his contract by September 1, 1916, the date in the contract, and did not perform its part of the contract by having the building ready for the contractor's work within a reasonable time. It was held, on appeal, that the contractor had a right to rescind the contract and to treat it as abandoned by the Board, and the judgment in favor of the contractor was confirmed—Board of Education v. Kerr, New Jersey Court of Errors and Appeals, 107 Atl. 259.

The following statement of facts shows the situation of the parties and the reasons for the judgment. The contract was dated March 2, 1916. The consideration was $3,600. It provided for the installation of a complete system of steam heating and ventilating apparatus in a high school building erected at Succasunna, in Morris County, N. J., by September 1, 1916; "provided the general construction of the building has been completed in time for proper installation and completion of heating and ventilating work on the date aforesaid." On the same day the Board entered into a contract for the erection and completion by that date of the school house in which this heating and ventilating system was to be installed by the defendant contractor. In December the defendant inspected the building and found that it was not sufficiently progressed for him to commence his work. No foundation had been constructed on which to place the boiler. He wrote a letter to the architect in which he said: "What are you going to do about this, and when are you going to get this building in shape to proceed? An early reply will oblige." No reply was received to this letter.

On July 3, 1917, the contractor wrote a letter to the Board offering to go on with the work at cost, plus 10%. On July 31, 1917, a three days' notice to proceed with the work was served on the contractor, as called for under the terms of the contract. On August 2, the contractor replied: "Inasmuch as you have failed to put the building in such condition that I could complete the contract within the time and at the price agreed upon, I of necessity abrogated it long since, thus leaving it to you to pursue such course as you may desire."

On August 24, the Board passed a resolution terminating the contractor's contract. Afterwards, a new contract was made for $2,120.20 in advance of the defendant's contract to do the same work. That amount is the sum for which the suit was instituted. The suit was commenced on February 4, 1918, resulting, as stated, in a judgment for the contractor. The appellate court considered this judgment was justified by the facts and the law.

Heating Contractor Generally an Independent Contractor, Not a Servant of Owner.

The Illinois Supreme Court holds, Shaw v. Dorris, 124 N. E. 796, that a declaration in an action against the owners of a building for injuries sustained by the falling of some insecure bricks from a wall during the construction of the building, which alleged that the plaintiff was a heating contractor, installing the heating under a contract from the owners, who had let the other construction work to another contractor, showed that both the general contractor and the heating contractor were independent contractors and not servants of the owner. It was therefore held, following the general rules, that the obligation to furnish a safe place in which to work applies only when the relation of master and servant exists, and not when a

contract has been entered into with an independent contractor for the erection of a building, which does not create the relation. The owner, it was held, is not liable for injuries resulting from the negligence of such contractor or of his servants or employees, nor is the owner liable for injuries to his heating contractor from the negligence of the contractor in the construction of the building, where both the heating and general contractors are independent contractors. An additional count based on the relation of master and servant was filed more than two years after the cause of action was alleged to have occurred; but this was held to state a new cause of action and was therefore barred by the two years' statute of limitations.

Value of Heating Materials Installed.

In an action to foreclose a mechanic's lien for heating materials and the like for asset of flat buildings in Minneapolis, furnished from September 13, 1915 to February 12, 1917, the landlord claimed that the trustee of the claimant company, on October 4, 1915, agreed in writing to furnish the materials "at prices of today, provided we get all the business. A discount of 5% allowed on total business." This agreement was signed by the trustee's accountant and credit man. The trial court found that the materials were furnished at their reasonable value and, therefore, not under a contract for a fixed price.

The Minnesota Supreme Court, on appeal, Hydraulic Press Brick Co. v. Mortgage Land Ins. Co., 173 N. W. 849, considered that such a contract as was claimed by the owner, made in a time of rising prices, was an unlikely one. It fairly appeared, or at least the trial court was justified in finding, that it was not called to the attenion of the trustee, or any one connected with him, until at the trial. The accountant and the investment company (the owner) were on close terms. The conduct of the parties in the furnishing of the materials, and the making of invoices and statements at reasonable value prices, to which no objection was made, was consistent with a furnishing on the basis of reasonable value when delivered, and somewhat inconsistent with a contract at a price by values when the building was commenced. The finding that the contract under which the materials were furnished was on a basis of reasonable value was held satisfactorily sustained.

The owner claimed that three boilers were defective. The court found not. The boilers were installed and used by the owner and the evidence was satisfactory enough that the defendant knew what boilers it was getting and accepted them. There was evidence that it did not properly install them. Judgment of foreclosure was affirmed.

Damages for Failure to Heat.

The Michigan Supreme Court holds, W. Duffer v. Colwell, 173 N. W. 355, that where the lease required the landlord to heat the buildings, he is liable for failure to heat them to the best of his ability with the means available, although the fuel regulations prevented him from complying fully with the terms of the lease; and that a storekeeper tenant can recover as damages, caused by his landlord's failure to heat the premises, loss of profits where the evidence established a loss, though the extent of the loss could not be established with certainty.

Heating Items Not Included in Specifications.

A bid to construct a building, according to plans and specifications and to install a heating plant and do the plumbing for a stipulated amount, was pinned to and deposited in a bank in connection with a loan for the construction of the building, but it was not referred to in the contract subsequently entered into, which named the same amount as the bid. In an action to foreclose a mechanic's lien the Iowa Supreme Court held, Stephenson & Peterson v. Loenson, 174 N. W. 570, that the bid was to be construed as part of the contract, entitling the owner to heating and plumbing work without extra payment therefor, although the plans and specifications referred to in the contract contained no reference to heating and plumbing.

CORRESPONDENCE

Snow as An Absorber of Moisture.

EDITOR HEATING AND VENTILATING MAGAZINE:

The enclosed clipping which is going the rounds of the daily press in regard to the use of snow at low temperatures to absorb moisture and thus dry garments raises a question in the theory of drying which may be of interest to the heating and ventilating profession. (The clipping reads: "A curious fact has been noticed by Arctic travelers—snow, when at a very low temperature, absorbs moisture and dries garments.")

Does snow really absorb moisture from the atmosphere or from surrounding objects, as the clipping seems to imply? It is conceded, of course, that snow can have very low temperatures, much below the congealing point, but does snow really absorb moisture, as any other spongy body might do.

What I imagine happens is that if there is an excess of moisture in the atmosphere, or in clothing near or in contact with snow, the very cold snow will condense the excess of moisture which will freeze and presumably increase the weight of the mass of snow. A lump of ice, we know, will condense the moisture from the air and build itself up in this way.

It is well known, as in the Arctic regions, that when one falls overboard and is fortunate enough to be pulled out, the moisture in the wet clothing will freeze very rapidly and will even disappear quickly from the clothing, so much so that one wonders where it has gone. Of course, when the clothing is frozen, or, rather, when the water in it is frozen, all one has to do is to take a light stick and beat the ice out of the clothing, or rub it out. The ice will break up into something like snow and disappear as a dust. The writer has had occasion to put on clothing that has been dried in this manner. While such clothing may not be wet, it is undeniably cold.

Perhaps of more importance, after all, to the heating and ventilating engineer is the use of snow to remove ordinary plumber's candle grease from cloth-

ing. The process is the same as removing the ice. All who have been victims of candle grease may note that if they will allow the candle grease to freeze, or nearly freeze, in the clothing, they can rub out the grease like dried mud. After two or three efforts no trace of the candle grease will be found on the clothing, at least, by ordinary visual examination. Or all one has to do is to take a piece of ice (or very cold water) and chill the grease in the clothing and then rub the clothing between the hands.

Of course, air at very low temperatures is very dry and will seize on the moisture in the clothing. It will first freeze in and then evaporate it so that the clothing actually dries in a very short time. In rubbing out candle grease, a little water seems to help, presumably on account of the evaporation and what one might call the "wetness."

I might say that it takes considerable courage to get into one's shirt after the ice has been beaten out of it, but this is better than waiting for it to dry on the body.

WILLIAM J. BALDWIN.

New York.

Problem in Laundry Water Heater.

EDITOR HEATING AND VENTILATING MAGAZINE:

I was much pleased at the masterly way in which one of your staff replied to my inquiries on above subject. (See February, 1920, issue).

I am sorry that I did not definitely state the boiler horsepower and the engine horsepower available so that your reply might be absolutely complete.

In your answer to Question No. 2, you advise admitting cold water to come in contact with the colder tubes and, as it heats, to come in contact with the hotter tubes, on the counter-flow principle. This is really what occurs in the heater mentioned, as the water is admitted to the heater through a big inlet pipe at a low velocity so that it stratifies, remaining coldest at the bottom. As a matter of fact, condensation is frequently held in the lower tubes composing the heating unit by the partial vacuum secured by rapid condensation, and the temperature of condensation rarely exceeds 110°, probably never in the summertime, when hot water requirements are greatest.

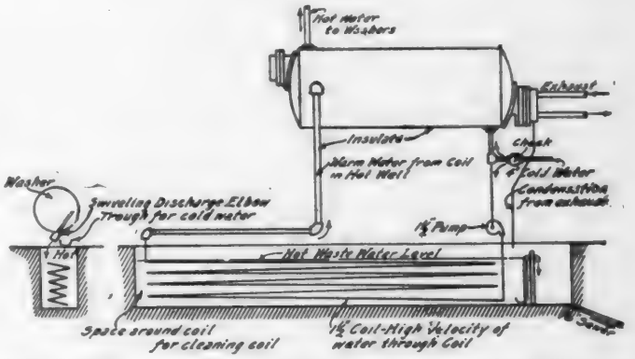
In your Fig. 5, you suggest an instantaneous-type heater to act as a drip cooler, and I suggest that inasmuch as the condensation temperature will not exceed 100° in the summertime, and the temperature of cold water will not be less than 70°, the fuel economies effected would hardly warrant the expense of installation.

The boiler horsepower in this plant is about 125. The engine is a Corliss engine, capable of developing 85 horsepower but, with total load, rarely develops over 40 horsepower. The heating surface in the exhaust steam heating unit is based on condensing 75 horsepower when water surrounding the tubes is at a temperature of 100°. Therefore, there is apparently an abundance of heating surface supplied. Hot water requirements would total about 2500 gal. per hour at 180°, or equivalent of about 100 horsepower, thus leaving about a 60-horsepower draft on boiler, to be supplied with live steam, which is more of a draft than the present boilers will stand with the other requirements for steam-using machines.

With live steam heating unit located near top of hot water storage, there is apt to be heavy periodical drafts on steam when the outlet water temperature is lower than required. Inasmuch as about 40% of the water is heated with exhaust and about 60% must be heated with live steam or some other means, doubtless a better design would have resulted if the live steam heating unit had been located on center axis of heater or even a little below, thus distributing better the boiler load. This is not a common construction among heater builders, but would seem to apply in this case.

In the final paragraph of your explanation, you suggest a means of inducing rapid circulation in the heater, but tests so far indicate that water surrounding tubes is invariably cold, while the hot accumulates and stores at the top. I would suggest that your sketch (Fig. 5), with thermostatic element located in outlet pipe, would not provide as reliable regulation as though the stem of regulator were inserted in the water to be heated and at the same level as live steam heating unit.

With an insufficient amount of exhaust steam and limited amount of boiler capacity, I have suggested



HOT WELL FOR RECLAIMING HEAT IN WASTE WATER FROM WASHERS, AS PROPOSED BY CORRESPONDENT.

to this laundryman that he provide a hot well for the hot rinses from washers, as sketched, and that he circulate wtih a centrifugal pump the incoming cold water through coil in hot well to heater. This will make necessary a swiveling elbow on outlet from washers so that the cold rinses may be discharged directly to sewer and hot rinses to sewer through the hot well. As the temperature of hot solutions from washers would be greater than the temperature of condensation from exhaust heating unit, and the volume of hot solutions would be over ten times as great, it would seem to afford greater economies to extract heat from these solutions rather than from the condensation which flows from exhaust heating unit, which however could also discharge to the same hot well. These solutions are not injurious to pipes, but contain so large a percentage of lint as to render them unfit for distribution through a commercial drip cooler, either of the U-tube or straight-tube floating-head pattern.

One economy which could be accomplished in this laundry relates to circulating hot water in supply lines by return connection to the base of heater, an economy frequently neglected in laundries.

Philadelphia, Pa. W. W.

The suggestion of the correspondent in regard to a hot well does not seem feasible even though it consists in reclaiming, as a by-product, the heat in the waste water from hot rinses of the washers and,

possibly, a certain amount of the soap. The latter depends upon retention of the water for a somewhat lengthy period, a matter which may not be practical to carry out nor is there always sufficient height above the sewer to enable a hot well to be thoroughly drained. An instance is on record of a party in California who is arranging to reclaim the water itself, but not the heat of the water.

The local board of health may object to a condition which is certainly not sanitary and would require frequent cleaning out, in particular at the bottom, necessitating removable floor plates and pipe coils arranged in convenient sections. The fouling would soon decrease the efficiency of heat transmission through the pipe coils to about 50% and would in time render the siphon inoperative. Incidently this siphon (if intended for this use) will not work as shown, since such devices cannot lift water from a lower to a higher level but rather vice versa and this is accomplished by having the long leg of the siphon on the discharge side.

While the solutions are not greatly injurious to pipes, it is well known that hot water will hasten the corrosion of pipes and, when used in connection with a certain amount of acetic acid to set the blue, together with other elements, the life of the pipe coils will certainly be shortened. If the pipes are used, they should be installed near the top of the hot well where the hottest water will accumulate.

Each washer is filled about half-full of water for the washing process, which is carried out on the following schedule:

Wash	Temperature	Time of Run
Cold rinse	Room temperature	5
First suds	Brought to boiling in 10-15 min.	25
Second suds and bleach	Brought to boiling in 10-15 min.	25
Warm rinse	140-°180°	5- 10
Warm rinse	140-°180°	5- 10
Warm rinse and acid	105°	5- 10
Blue	105°	5- 10
Rinse	105°	5- 10
Rinse	105°	5- 10
		85-115

Probably some of the steps in the schedule will be omitted on account of the class of work handled by the particular laundry under consideration, but in general it will be seen that only the heat in the water at 140° to 180° will be sufficient for reclamation, if at all. The hot water will be considerably lower in temperature after use in the washer, while the amount will be considerably less than the 2500-gal. hot water demand; and, providing the entire amount of the heat above the temperature of the cold water in the pipe coil were capable of being absorbed, it would still be far from sufficient to supply the 60 H. P. make-up. It is even possible, and quite probable, that the water from the water heater will be higher in temperature when circulated through the hot well than the waste water in the latter, from which it will be seen that the heater will give up heat to the hot well rather than reclaim it. This condition may exist at certain periods or even for a greater part of the time.

The speed of the pump or the velocity of the water flow shauld be varied to suit the temperature and amount of water in the hot well, while at other times, the pump should be stopped entirely. Altogether, this calls for a refinement of operation which may be continued at first but will not be carried out after a lapse of time.

Gravity circulation to and from the heater could be arranged, omitting the pump, consequently its first cost and cost of operation, though doubtless what the correspondent has in mind, is a decrease in the size of hot well by retaining the waste water for a shorter period of time, necessitating a higher velocity of the cold water to take up the heat more rapidly. If, however, the size of the hot well is not important, another means of reclaiming further heat could be accomplished by installing a maximum of heating surface in the hot well.

The cold water supply pipe from the main should not enter the suction side of the pump, as shown by the correspondent, but rather the discharge side, for the reason that hot water is being drawn from the heater for a greater portion of the time. Such water taking the line of least resistance will pass directly from heater coldwater inlet to hot water outlet, but if connected as advised, the cold water make-up must pass through the coil in the hot well and would not be obstructed by passing through a small size pump.

The condition of partial vacuum within the lower exhaust tubes of the heater may not be due to rapid condensation, unless by this is meant condensation more rapid than the insufficient supply of exhaust to the tubes due to lack of available exhaust steam. The vacuum will retain the condensate within the coil since the pressure of this condensation is insufficient to discharge itself unless drained by a trap of the lifting type. Such a trap has its vent connected to the return from the heater so that the pressures in the coil and the trap are the same. The efficiency of the coil will also be reduced until the water is removed, a matter which takes considerable time.

The lifting type of trap is operated by three valves, steam, vent and discharge, and is used where the pressure of the condensation is insufficient to discharge the water. In filling, the steam and discharge valves of the trap are closed and the vent valve opened, so that any pressure in the trap tending to prevent flow of condensate to it, is avoided. The steam valve is connected to the pressure steam piping and opens, together with the discharge valve, when the trap is discharging, meanwhile the vent valve is closed, but opens after the operation is complete so as to relieve the pressure within the trap.

A non-return trap cannot be used with any degree of success in connection with a water heater, even if connected to the live steam coil. This type of trap is used wherever the pressure of the condensation is sufficient to lift the water to the point desired. The discharge valve remains closed until the condensation collects, when it opens and the pressure of this condensation forces the water out of the trap, after which the valve closes. The trap, in this case, does no real work to move the water, since this is done by the pressure of the condensation, which must always be greater than that in the trap discharge pipe.

It is still possible that better diffusion throughout the interior of the tubes may be secured by locating the cold water inlet pipe away from the tubes, instead of creating near the tube head a point of condensation which is in excess of other points. As to the connecting of the regular stem, this is often done with good results by either method; in fact, most catalogs seem to show the stem installed at an elbow.

USE OF ADDITIONAL SMALL HEATER EXPLAINED.

The correspondent errs in interpreting the former

sketch and suggestion for a drip cooler since in neither of these is such a purpose indicated. If the article is re-read, it will be found that an additional small heater of the water-tube type is advocated in order to supply the necessary additional heating surface at a lower first cost. This cost should be less than required to excavate and build a hot well along the washers in an existing building, together with the cost of pump, pipe coil, water and sewer piping, all of which is to be done to secure problematical results. With the small heater installed, the boilers and settings can be placed in good condition, the boilers forced and an undergrate draft blower installed. The kind, amount, and method of firing coal should be considered while the heater should also be maintained in an efficient condition by proper cleaning and draining.

From the correspondent's statements, the exhaust steam heating unit is insufficient (being based on the condensing of 75 H. P. whereas the hot water demand is 100 H. P. The exact conditions are still uncertain since engine, rather than boiler, horse-power is usually spoken of in connection with engines. The 40 H. P. is evidently engine horse-power, and if so, this may be in terms of indicated or brake horse-power. In any event, it cannot be deducted from the boiler horsepower which is a different thing, unless it has been changed to the same terms. A Corliss engine in its prime may use only 22 lbs. of steam per I. H. P. but it is more apt to consume 30 lbs. after being in use for some time. Something more definite should be known regarding the steam consumption and mechanical or thermal efficiencies of this engine.

So long as the oil separator is of proper capacity and in good condition, the condensate from the exhaust coil of the water heater should be returned to the feed-water heater by means of a trap of the lifting type, as previously described. If drained to a hot well, only a portion of its heat could be reclaimed at the most, while the water itself would be wasted.

In conclusion, though the exact conditions are unknown, it is believed that the amount of the exhaust and heating surface are still insufficient for the requirements. It is recommended as before, that a small water-tube heater be installed, and though offhand, the boiler capacity also appears insufficient, doubtless it may be improved to the necessary extent, as advised.

Value of Sheet Asbestos on Hot Air Pipes.

The discovery, reported in THE HEATING AND VENTILATING MAGAZINE for January, 1920, that an asbestos-covered hot air pipe loses 33% more heat from its surface than a bare one, has brought out considerable discussion emphasizing the point that this refers only to thin layers of asbestos paper. For instance, L. B. McMillan, writing in *Mechanical Engineering*, states that "there is nothing new or remarkable in the fact that a bright galvanized-iron surface will radiate heat at a much slower rate than a dull mat surface. Therefore, it is not surprising that placing over the bright surface a very thin layer of asbestos paper should increase the radiation. The paper was only a little over 1/100-in. thick." He adds that it should be borne in mind that the high surface resistance to heat flow presented by a bright surface decreases rapidly as the surface becomes tarnished or if it is painted. Therefore, the radiation from such surfaces becomes much greater.

"The principal cause for mistaking the true significance of the statements" he says "was the failure on the part of the average reader to distinguish between mere asbestos paper and asbestos insulation. This distinction was not mentioned in the article and it has been but natural that the casual reader should attribute to asbestos in general the poor results shown by the test for very thin asbestos paper.

"The contribution is an arraignment and rightly so of the practice of covering furnace pipes with a thin layer of asbsetos paper. The belief has been too prevalent that pipes covered with asbestos were properly protected, regardless of the thickness or quality of the asbestos. Therefore, instead of indicating any lack of usefulness of asbestos, the results of these tests properly interpreted bring out more forcibly the need for sufficient thickness of proper insulation."

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Summer Meeting of Heating Engineers in St. Louis May 26-28

Announcement has been made that the semi-annual meeting of the American Society of Heating and Ventilating Engineers will be held in St. Louis, the last week in May. This will be the week of the Spring meeting of the mechanical engineers' society in the same city and will be just previous to the meeting of the American Society of Refrigerating Engineers, also in St. Louis. The fact that much of the work of the refrigerating engineers and of the heating engineers, is along the same lines will make the two conventions doubly attractive and interesting.

New York Chapter Acts on Economic and Industrial Problems.

Aroused by a series of brilliant and thoughtful addresses at its March meeting on the subject of "Economic and Industrial Problems," with special reference to the present abnormal price and other conditions, the New York Chapter appointed a committee consisting of Frank T. Chapman, chairman; C. L. Riley, W. H. Driscoll, J. I. Lyle and Frank K. Chew, to summarize the various points brought out and draw up a comprehensive statement on the industrial situation with a view of helping to crystallize sentiment and action among engineers generally.

President Perry West sounded the keynote when he stated that conditions in the labor and commodity markets were growing worse, rather than better. It is useless, he said, to expect labor to go back to the pre-war basis, although, on the other hand, he did not believe labor will get all it is asking for. There will have to be a compromise. The two factors of competition and ambition will have to give way to co-operation and the best interests of all. Human impulses are naturally vicious and we have yet to grasp the fundamental truth of the saying, "It is more blessed to give than to receive." The present conditions in which

capital controls business and the unions control labor are becoming unbearable. Business must be managed from something more than only a profit-producing standpoint.

We are now confronted with the production in great quantities of non-essentials, such as automobiles, motion pictures and phonographs, while the country is still short of essentials. The politicians are adding fuel to the flames, he added, in their campaigns against public utilities.

Mr. West endorsed the proposed solution in which the control of credit capital would be in the hands of the producers of wealth, while labor, he said, should be made to co-ordinate with industry. This would place industry on an economical and productive basis and would provide means for exercising control of expenditures over materials and production.

As an instance of the reckless manner in which America is now spending money, Mr. West cited the fact that out of the total wealth produced in this country each year, amounting to $15,000,000,000 no less than $5,000,000,000 are spent for luxuries, while another $5,000,000,000 go for non-essentials.

COUNTRY ENTERING A NEW INDUSTRIAL ERA

Mr. West then introduced Champlain L. Riley who told of the progress being made towards co-operation among the consumers. He expressed his belief that we are definitely entering a new industrial era in which Capitalism as such is coming to an end. Already, he said, in England, one-third of the food and clothing is bought and sold through co-operative societies, while in Russia great strides have been made recently in the growth of the co-operative idea. It has come to the point where these co-operative societies are running cargo ships between Russia and England, bringing back raw materials from Russia, and flying a new flag never heretofore seen upon the ocean. This, he considered, a striking sign of the trend of events. In this country the railroad brotherhoods are now manufacturing knitted goods for their members and have started to raise their own cotton and spin it in their own mills. This sort of thing will grow and engineers must "get aboard." The significant feature of the movement, he said, is the fact that it is being carried on by the consumers themselves, thus differentiating it from the efforts of manufacturers in the way of bonuses and stock dividends.

NEED OF NATIONAL ORGANIZATION OF ENGINEERS.

William H. Driscoll who spoke next, declared that when it comes to "big business," the business of the home outranks all others. In solving the present industrial problems he said the need of the times lies in the scientific manipulation of finance and the industrial arts. He said we could take a lesson from the mediaeval guilds which were organized to include all persons connected with the craft. Capital has no moral right to extort excessive profits nor has labor any moral right to exact unreasonably high wages. Mr. Driscoll favored the formation of a national organization of engineers so that the engineering world could throw its united influence towards the establishment of normal conditions in the industrial world.

J. I. Lyle, speaking from the manufacturer's standpoint, expressed the opinion that only a small percentage of the capitalistic class could be placed in the non-productive category. He thought on the whole that capital is controlled by the productive element. He told how his company started out as a co-operative organization and how the idea was carried down to the office boy. When, however, it was attempted to put the same idea into practice in the factory, it was found that the unions were opposed to that kind of co-operation and the plan failed entirely. Mr. Lyle expressed his opinion that the sympathetic strike should be made illegal. He thought co-operation throughout industry was bound to come in some form and must include a division of profits.

REVIEW OF CO-OPERATION AMONG THE HEATING CONTRACTORS

W. L. Fleisher, vice-president of the chapter, told of the course of co-operation among the contractors. He described the unenviable position of the sub-contractor in former days when the business mortality among them amounted to fully 50%. The co-operative movement among them was started about 1885 and at first was directed against the encroachments of union labor. The formation of building trades employers' associations was an outgrowth of this movement. The idea then developed that competition was the chief cause of the trouble and attempts were made to overcome this through the use of open-price systems, such as the Eddy system, and in other ways. This, however, led to charges of infringement of the Sherman anti-trust law and, for that reason, was not as successfull as was hoped. The feeling in the building trades is still tense as between the employers and the unions and no solution has yet been proposed that will successfully meet this difficulty.

Frank T. Chapman told of the platform on which the latest Industrial Conference in Washington is working and expressed his belief that it is following the right lines. At the conclusion of his address, he moved the appointment of a committee to draw up a comprehensive statement embodying the material brought out at the meeting. This motion was carried.

P. J. Daugherty said the subject could be summed up by saying that we have before us a moral question. Heretofore we have been taught to believe that individual success was the thing to strive for, rather than the general welfare, and our school textbooks have been filled with the stories of individual attainments, which, he said, have been unduly emphasized, leading young people to embrace the doctrine of "every man for himself and the devil take the hindmost."

Mr. Riley, in the discussion which followed, stated that irrespective of the moral question involved, the present situation was the thing to be studied. We are facing new conditions, he stated, and as engineers we must recognize them and be participants, rather than onlookers.

COMMITTEE NAMED TO CONDUCT RESEARCH DRIVE.

During the business session, President West announced the appointment of a committee, headed by R. A. Wolf, to be known as the New York Chapter Committee for Research Fund Drive. This committee will act to secure additional and renewal funds for the society's Research Bureau, the drive to be conducted from April 1 to May 15.

It was also announced that a committee had been appointed on Field Research Work, in co-operation with the Research Bureau. This committee is made up of J. A. Donnelly, chairman; W. S. Timmis and W. H. Driscoll.

Research Bureau Meeting of Illinois Chapter.

Officers of the American Society of Heating and Ventilating Engineers, including President E. Vernon Hill, F. R. Still, chairman of the Research Bureau Committee, Director John R. Allen, director of the Research Bureau, and Secretary C. W. Obert, were present at the March meeting of the Illinois Chapter, held at the Engineers' Club, March 9, to arouse wider interest in the work of the society and especially in the Society's Research Bureau in Pittsburgh. All of the speakers had visited the Michigan Chapter the night before, as part of a "swing around the circle," the other cities in the itinerary being Minneapolis, Kansas City and Louisville.

In the absence of President John Howatt the meeting was presided over by Vice-President J. C. Hornung. In Mr. Still's appeal for a more liberal contribution from Illinois for the Research Bureau, he stated that Michigan's contribution had exceeded that of Illinois by more than 32%. One-third of the total contributions for this week has come from western chapters. He recommended that the city be divided into districts and committees organized to obtain contributions. "It can successfully be done in a day," he said, "and it also furnishes an opportunity to sign up new members for the chapter."

Professor Allen said that in addition to the work being done at the Research Bureau, co-operative research work in heating and ventilation is being conducted at the University of Michigan, University of Minneosta, Carnegie Institute, Yale University and the University of Pennsylvania.

Dr. Hill bespoke wider interest in the work of the Research Bureau. "We are getting somewhere," he said, "and there is no reason why we should not lead every engineering society in the country."

The meeting was then turned over to the special committee of the evening, R. A. Widdicombe, chairman, for the discussion of "Meters." E. G. Bailey, president of the Bailey Meter Company, spoke at length on the development of meters, their economies, etc. his address being followed by an interesting discussion.

Minnesota Chapter.

The presence of F. R. Still, chairman of the heating engineers' society's Research Bureau; Director John R. Allen, of the Research Bureau; and Secretary C. W. Obert, made the March meeting of the Minnesota Chapter one of unusual importance. The chapter met March 10, at the Andrews Hotel, 52 members and guests being present. A dinner preceded the business session. President J. V. Martenis then presented Mr. Obert, who talked of society matters, including the contemplated change in dues. He also urged those present to arrange to attend the society's summer meeting in St. Louis. Mr. Still, who spoke next, gave the members an idea of the means to be taken in raising the chapter's quota of the Research Bureau expense and told of what the other chapters were doing in this connection. Director Allen gave an account of the progress of the bureau, giving a very encouraging outlook for the future. He stated that he has worked out a new formula for figuring heat losses through underground pipe covering, which will be presented at the St. Louis meeting.

Annual Meeting of Eastern Pennsylvania Chapter.

New officers were elected at the annual meeting of the Eastern Pennsylvania Chapter, held March 11th, at the Engineers' Club, Philadelphia, as follows:

President, E. S. Berry; vice-president, William G. R. Braemer; secretary, Raymond E. Jones; treasurer, A. S. Mappett; board of directors, the officers and C. V. Haynes, John McClintock and John F. Hale.

The guests, who were introduced by the retiring president, Charles V. Haynes, included Dr. E. J. Cattell, city statistician; A. M. Bliss, chief of the U. S. Weather Bureau in Philadelphia; C. L. Riley, vice-president of the heating engineers' society; J. I. Lyle, until recently chairman of the society's Research Bureau Committee, and Treasurer Homer Addams.

Ohio Chapter Discusses Anti-Corrosion Engineering.

F. N. Speller, metallurgist for the National Tube Co., Pittsburgh, Pa., was the principal speaker at the March meeting of the Ohio Chapter, which was held March 11, at the Statler Hotel. His address was on the subject of "Anti-Corrosion Engineering," and was accompanied by lantern slides. Mr. Speller detailed many of the points brought out in his paper on the same subject presented at the recent annual meeting of the heating engineers' society.

NATIONAL DISTRICT HEATING ASSOCIATION

Annual Convention in Chicago, May 25-27.

The National District Heating Association will hold its eleventh annual convention in Chicago, May 25, 26 and 27, 1920. Headquarters will be at the LaSalle Hotel. The hotel has placed the entire seventeenth floor at the disposal of the association.

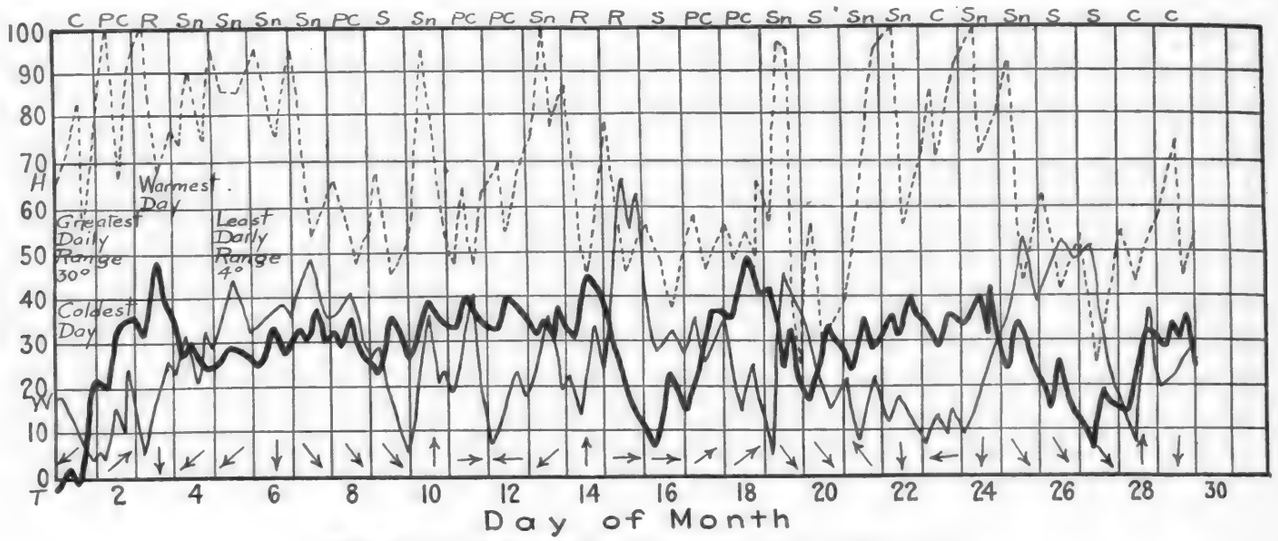
The program this year is of exceptional interest. R. V. Stureman, Springfield, Ill., will present a paper on "Advantages and Disadvantages of Steam and Water Heating." The General Electric Company will present a paper upon the later types of bleeder turbines as used in connection with central station heating. Prof. J. D. Hoffman, Purdue University, will present a paper on "Technical School Training for the Heating Profession." Prof. J. R. Allen of the American Society of Heating and Ventilating Engineers' Research Laboratory, will address the convention on "Heat Losses from Underground Pipe." J. C. Hobbs, president of the association, will present a paper on the subject of Central Station Operation.

In addition to these papers and addresses there will be two addresses from speakers from Chicago, and reports from the following standing committees: Heating Research, J. A. Donnelly, New York, chairman; Meters and Accessories, R. C. March, Chicago, chairman; Station Operating, F. B. Orr, Chicago, chairman; Educational, J. H. Walker, Detroit, chairman; and Accounting, A. D. Spencer, Detroit, chairman.

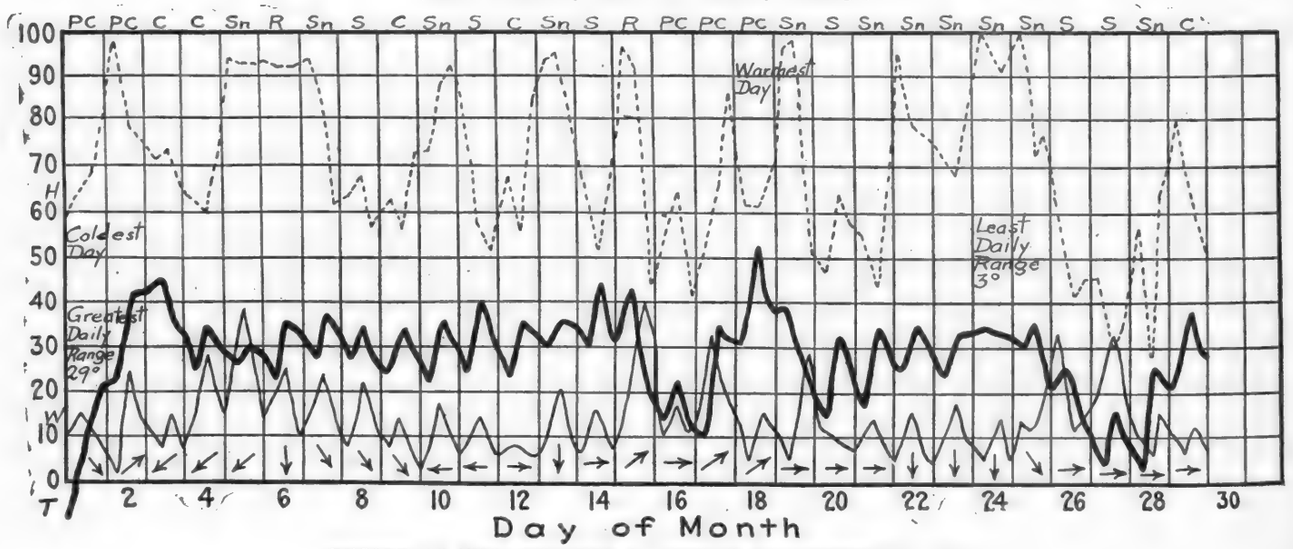
In addition to its program the convention will have an instructive exhibit in connection with its meeting.

THE WEATHER FOR FEBRUARY, 1920

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	49	52	60	49	64
Date of highest temperature	3	18	2	2	2
Lowest temperature, degrees F.	–3	–7	4	–7	5
Date of lowest temperature	1	1	16	15	16
Greatest daily range, degrees F.	30	29	32	33	30
Date of greatest daily range	1	1	1	16	16
Least daily range, degrees F.	4	3	2	3	3
Date of least daily range	5	24	8	12	4
Normal temp. for month, degrees F.	29.1	28	28.2	25.8	34.8
Normal mean temp. for month, degrees F.	30.7	28	31.8	25.4	33.5
Total rainfall, in.	6.56	5.88	1.62	0.12	0.74
Total snowfall, in.	24.2	32.5	6.6	1.7	1.0
Normal precipitation, this month, in.	3.87	3.44	2.66	2.24	2.86
Total wind movement, miles	15052	8597	9268	8237	8842
Average hourly wind velocity, miles	21.6	12	13.3	11.8	12.7
Prevailing direction of wind	N. W.	W.	N. W.	N. W.	N.W.
Number of clear days	6	6	4	6	7
Number of partly cloudy days	10	10	5	7	8
Number of cloudy days	13	13	20	16	14
Number of days on which rain fell	4	2	3	2	5
Number of days on which snow fell	11	11	11	5	2
Snow on ground at end of month, in.	4.5	16.9	0.3	None	None



RECORD OF THE WEATHER IN NEW YORK FOR FEBRUARY, 1920.
(Relative Humidity Plotted from Hourly Readings.)



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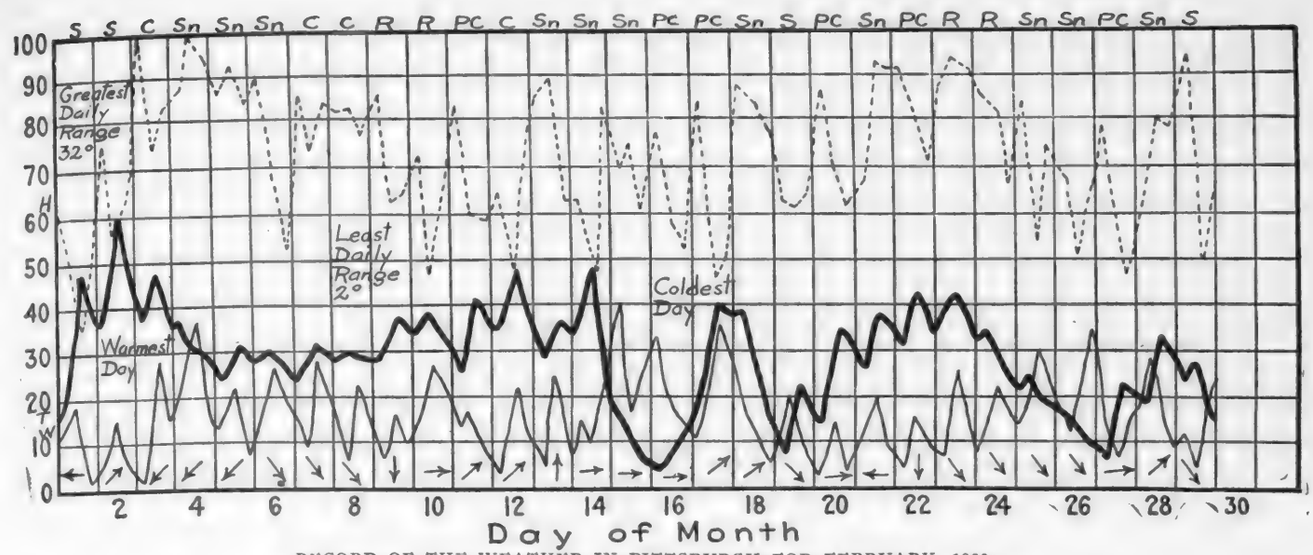
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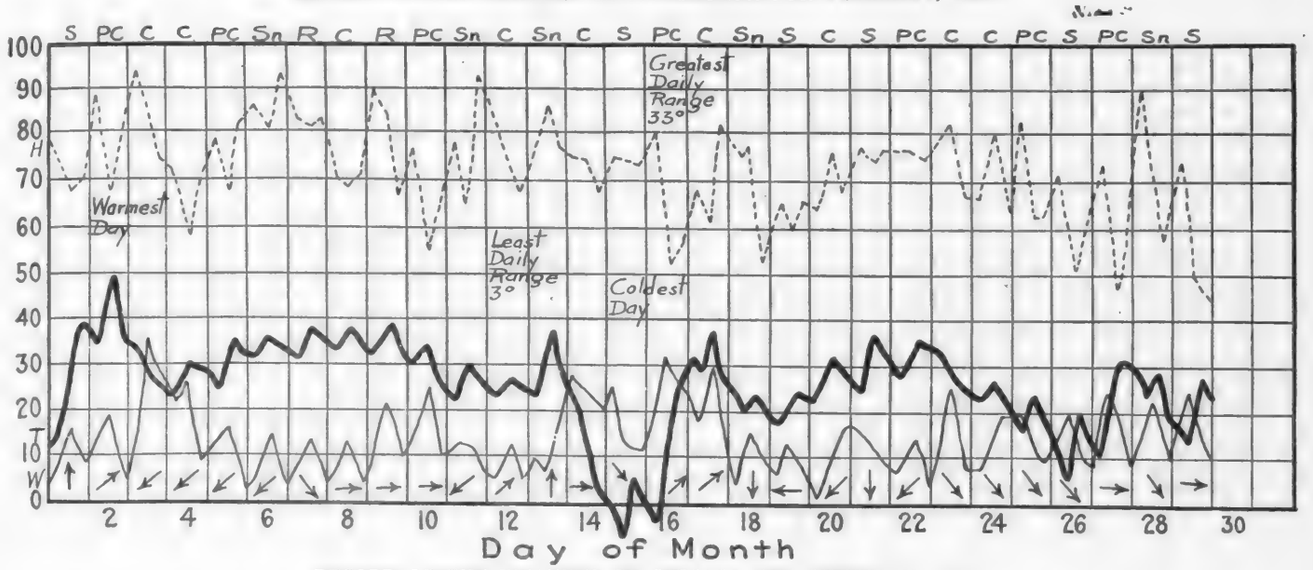
RECORD OF THE WEATHER IN PITTSBURGH FOR FEBRUARY, 1920.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Warmest Day
Least Daily Range 3°
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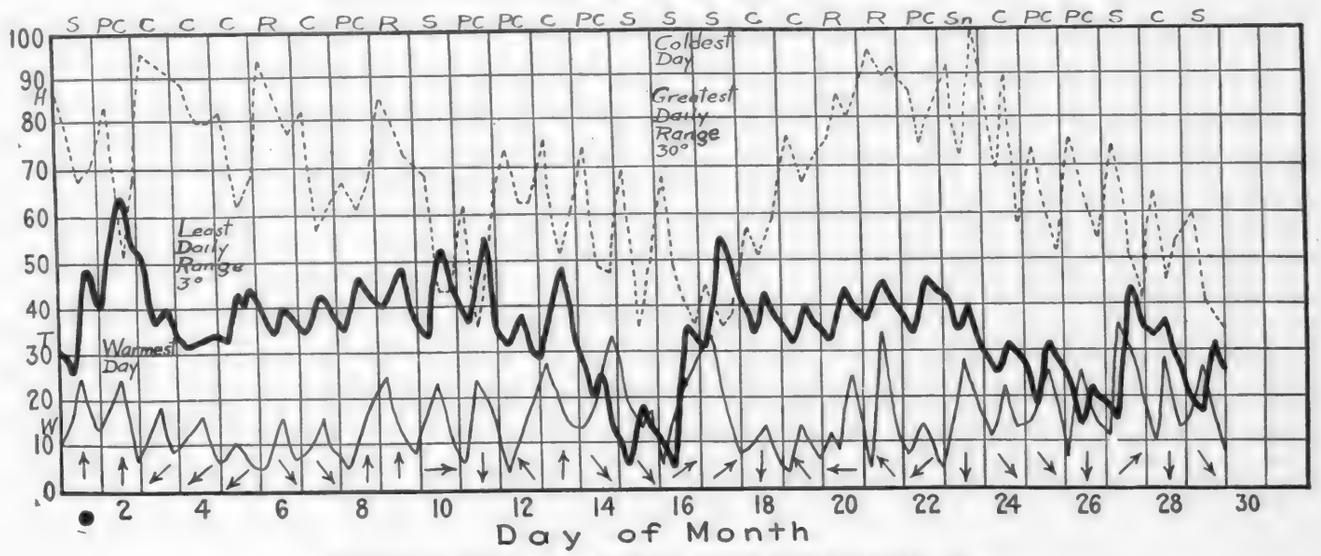
RECORD OF THE WEATHER IN CHICAGO FOR FEBRUARY, 1920.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Coldest Day
Greatest Daily Range 30°
Least Daily Range 3°
Warmest Day
H
T
W
100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN ST. LOUIS FOR FEBRUARY, 1920.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudly, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

NATIONAL TRADE EXTENSION BUREAU

New Bulletins on Estimating, Contracting and Accounting.

"The Principles of Estimating and Contracting of Heating Installations" and "A Comprehensive System of Accounting," constituting Parts III and IV of the Business Efficiency course conducted by the National Trade Extension Bureau, have been published. Parts I and II of this course dealt with "Fixed Charges" and "Estimating."

The booklet on "The Principles of Estimating and Contracting" has been prepared for the express purpose of pointing out to the heating contractor a better and more comprehensive method of conducting his estimating department. From the survey made by the bureau it is stated that on the whole the heating fraternity has developed very thorough and comprehensive printed forms. Few establishments, however, have a complete system whereby an intelligent analysis of the business can be made upon any particular class or character of work, or as to the healthy or unhealthy condition of the business as a whole.

In explaining the principles an example is taken of a fair-sized job of vapor heating, installed in a two-story residence of brick construction. Incidentally it is stated that of forty-four contractors who figured the job as they would do in competition, only four of the entire lot agreed as to the cost and selling price. Less than a dozen estimated the job in such a way that any other person could intelligently tell what the contractor had figured upon.

Several methods of figuring heat transmission are given, including the Mills rule, the "chart" rule, in which use is made of a chart used, in different forms, by many contractors; and, finally the B. T. U. method.

Regarding boiler sizes, the bureau, it is stated, has received a multitude of plans and methods for determining the sizes of boilers, due to the fact that the quality of coal varies in different localities. Where firebox and tubular boilers are used, it is recommended that 35 per cent be added to the actual radiation used, the total of which will represent the boiler size needed. In the case of cast-iron boilers burning hard coal, the common practice is quoted of adding 80% to the actual radiation set for boilers carrying less than 100 sq. ft. of radiation; 60% to those carrying from 1000 to 2000 sq. ft. of radiation; and 50% for larger amounts of radiation. In localities where soft coal is used, the practice is quoted of adding 100% to the net amount of radiation in determining the boiler size on all boilers carrying 1000 sq. ft. of radiation or less. On those carrying from 1000 to 2000 sq. ft., 80% is added, and for larger boilers 70% to the net amount of radiation.

Special attention is called to a practice often followed in heating small factories, stores and garages where the heating is figured from zero to 50° or 60°. In determining the size boiler to use in buildings thus heated, it is stated that the amount of radiation necessary to heat the building to 70° should first be determined, and the boiler based on these figures, instead of on the amount of radiation necessary to heat the building to 60°.

The booklet then goes on to discuss the estimate of the job given. In this connection a heating estimate sheet is presented, containing the layout and principal data of the job. An interesting table of pipe sizes for vapor heating systems is added including the sizes for both supply and return mains. The latter are given as follows.

Radiation, Sq. Ft.	Size of Return Main, In. Diam.
80	¾
100	¾
200	¾
300	1
400	1
500	1
600	1¼
800	1¼
1000	1½
1400	1½
1800	2
2000	2
3000	2
4000	2½
6000	3
8000	3
10000	3

The next sheet discussed is the "tabulating quantity sheet," which is intended to give complete information as to the material necessary. A "heating estimate cost sheet" follows, to be used as a guide to the estimator and not intended as a tabulating or computing sheet in any sense. It simply carries the total cost of the items as figured on the other sheets.

A typical heating estimate formula is given, covering such items as labor, boiler foundations, boiler coverings, breechings for cast-iron boilers and pipe and fittings. Where prices are required from jobbers or manufacturers on material to be purchased by the heating contractor, a special form is recommended which was published in Part II of the Efficiency Course.

The bulletin concludes with rules for establishing a selling price, five methods being shown, two of which are specified as wrong ways of arriving at the selling price.

The contract form published in Part II of the Efficiency Course is recommended to the heating trade and attention is also called to the form put out by the Central Supply Association.

BULLETIN ON ACCOUNTING.

Part IV of the Efficiency Course, on "A Comprehensive System of Accounting, Including All Necessary Books and Forms," gives complete details of a book-keeping system designed for heating and plumbing contractors, with illustrations of all forms to be used. The booklet has been prepared after an inspecition of systems in use in various parts of the country. The bureau has in stock a supply of the various forms illustrated, the prices of which are published on a sheet accompanying the bulletin. In arranging to install one of these systems, the contractor should write to the bureau, giving information on the following points:

1. How many journeymen do you employ?
2. How many orders do you average per month?
3. How many customers' accounts do you usually have on your books?
4. What is the amount of your annual business?

Directory of Plumbing and Heating Contractors.

As previously announced, the classified directory of plumbing and heating contractors in the United States has been issued by the National Trade Extension Bureau. The directory contains no less than 8,000 names, those who do heating work exclusively being indicated by a dagger. The directory is not for sale, except to contributors to the bureau. One copy is furnished each contributor and extra copies, with supplements, are furnished at $2.00 each per year.

The Monthly Service Bulletin of the National Trade Extension Bureau for February, 1920, contains, among other things, an "Outline of Profit-Sharing or Bonus Scheme for Plumbing and Heating Business." The plan, in brief, involves setting aside a general fund not to exceed 10% of the total net profits on each job, contract or sale, to be distributed in the proper proportions at yearly periods. A portion of this fund would go towards a sick fund which would be apportioned annually, pro-rated according to the total amount of the fund and sick time of the employee, not to exceed full time. If the fund is sufficiently large full time might be paid the employee for his time lost owing to illness.

In addition a special bonus or commission is provided for, to be given to any employee who sells fixtures or appliances over and above those specified for the job on which he works.

Future Plans of Trade Extension Bureau.

As the result of action taken at a recent meeting of the board of directors of the National Trade Extention Bureau, the bureau will undertake the work of the Bureau of Standardization, heretofore conducted by the National Association of Master Plumbers and a number of other organizations. In order to finance the bureau during the coming year it is proposed to divide the country into zones and appoint a leading manufacturer in each zone to assume the responsibility of getting in touch with every manufacturer and jobber located in that zone. The actual work of soliciting subscriptions will be in the hands of committee made up equally of master steam fitters, master plumbers and jobbers.

The bureau was directed to prepare a designation to be used by all contributors on their stationery and in their advertising and circular matter, as follows:

> Member
> of
> National Trade Extension Bureau
> of the
> Heating and Plumbing Industry.
> No.....

The next meeting of the board of directors will be held in Pittsburgh in June, following the meeting of the Central Supply Association and just previous to the convention of the National Association of Master Plumbers.

"Standard Conditions" Adopted by Heating Contractors to Form Part of Proposal.

A set of "standard conditions" has been drawn up by the Heating and Piping Contractors' National Association to form a part of proposals for heating and ventilating work. They are intended to be printed on the back of the contractor's letter head, which will contain a form letter to the effect that "this proposal is subject to change without notice and is for immediate acceptance, which acceptance shall be subject to the conditions printed on the back of this sheet to which reference is hereby made."

The conditions, which include the important clause that tests of the system shall be made in accordance with standards established by the American Society of Heating and Ventilating Engineers, are as follows:

1. Sufficient space shall be provided on the premises by the purchaser for the material and for the proper prosecution of the work.

2. All labor and material required to complete the work not included in this proposal, shall be provided by purchaser in such manner as not to delay the progress of the work.

3. The purchaser shall provide a chimney of proper dimensions and draft for the apparatus proposed herewith.

4. All cutting through floors or walls for the installation of this work, and finishing around same after work is completed, shall be done by the contractor, unless otherwise provided in contract.

5. The contractor will guarantee the installation against original defects of material and workmanship, for a period of one year from the date when the apparatus is ready for practical use, and agrees to replace, without expense to the owner, any part requiring replacement within that period, due to inherent defects of material and workmanship. Contractor's liability in this matter extends only to the labor and material furnished, and does not cover any contingent liability, either to buildings, contents, products or persons.

6. If the work comprehended by this proposal covers the installation of material and apparatus under specifications made by others, the performance liability is not assumed by the contractor. Should the contractor guarantee temperatures or operation of this system, and tests be required, such tests shall be made by the contractor under standards established by the American Society of Heating and Ventilating Engineers.

7. If upon completion of work, weather or other conditions over which the contractor has no control, do not permit of a proper test, this shall not be considered a sufficient reason for withholding payment.

8. This proposal is based on the prevailing rate of wages and the execution of the work during regular working hours.

9. The contractor shall not be held liable for delays, strikes or causes beyond his control.

10. Title of ownership of all apparatus and materials furnished under this proposal shall remain with the contractor until final payment is made, and the contractor shall have the right fo remove same, should default in payments occur.

11. Unless special terms are made at the time of entering into contract, it is understood that payments of 90 per cent monthly of the value of materials delivered, as well as labor performed, are to be made, and the balance paid on completion.

12. Any dispute arising under a contract based on this proposal that is not settled within thirty days, shall be referred to two arbitrators, one selected by each party to the contract. Should they be unable to agree, they shall select a third arbitrator. The decision of a majority of these arbitrators must be given within sixty days from the date of reference, and shall be binding on both parties to the contract; one-half the cost of arbitration to be paid by each party to the contract.

The "Standard Conditions" were drawn up by the Association's Standardization Committee of which W. L. Fleisher, of New York, is Chairman.

National Chamber of Commerce to Hold "Increased Production" Convention.

Seeing in increased production a means of restoring normal business and price conditions, the Chamber of Commerce of the United States will make its eighth annual meting, to be held in Atlantic City, April 27-29, an "Increased Production" convention. Lack of production, it is pointed out, is one of the chief causes of the high cost of living, which cannot be reduced until more goods are put on the market. The present is a seller's and not a buyer's market. Prices have been forced up by competitive bidding. Even with the exchange situation as it is, with its threatened curtailment of exports to Europe, manufacturers generally believe it will be a long time before production in the United States catches up with the demand for goods.

The general subject of increased production has been divided up in the program for the convention into sub-subjects. The first to be taken up will be the government in relation to production, with special reference to anti-trust legislation and taxation. Transportation in relation to production will then be considered, while international finance and its relation to world production has a prominent place on the program. Other sessions will deal with agriculture and labor. Besides the general sessions there will be group meetings, divided along the great divisions of industry.

National Foreign Trade Convention.

The seventh National Foreign Trade Convention, called by the National Foreign Trade Council, will be held in San Francisco, May 25-15, 1920. Delegations of foreign business men will be present to represent the commercial interests of all the Pan-American and Pacific countries. Secretary O. K. Davis, 1 Hanover Square, New York.

Sanitary and Efficiency Show in Pittsburgh in June.

The larger viewpoint in industry is shown in the plans for the exhibit in connection with the annual convention of the National Association of Master Plumbers in Pittsburgh, June 14-19. This exhibit will assume the title and dignity of a "Sanitary and Efficiency Show," and while it will consist largely of plumbing exhibits, many types of heating apparatus and devices will also be shown. Among the manufactures of

heating goods already down for exhibits are: National Tube Co., Toledo Pipe Threading Machine Co., and the Haynes Selling Co.

First Annual Meeting of National Federation of Construction Industries.

An event described as unique in the history of American business was the first annual meeting of the National Federation of Construction Industries, in Chicago, March 24-25. It was said to be the first meeting of a regularly-constituted business organization representing the entire construction industry. Among the more important steps in the direction of organization that were to be considered is the proposed division of the United States into twelve "Federation Districts," co-terminous with the Federal Reserve Districts, in each of which there is to be an executive committee. It is also proposed that an abvisory board of the federation shall be created, in which each constituent national association shall have two members at large and one member from each federation district. Each regional association will be represented by one member at large and one member from each federation district into which its activities extend. Each local association will be represented by one member in the district in which it is located. The district executive committee will be composed of the federation vice-president resident in the district, who will serve as chairman, and of the members of the board of directors and advisory board in the district. This committee will have authority to deal with construction problems locally in the name of the National Federation of Construction Industries, to sub-divide the district in such manner as will enable it to carry on its work most effectively, and to do other things to promote the interests of the combined industry in the district.

Another important step contemplated by the Federation is the creation of what it is intended shall be known as the "Staff Council of the National Federation of Construction Industries." This council is designed to be composed of the staff personnel of some hundreds of national regional and local construction associations. The staff council will be divided into sections, composed of executives, legal counsels, engineers, statisticians, publicity experts, traffic managers, etc.

For More Technical Libraries.

An important movement has been undertaken by the American Library Association for the establishment of more technical libraries. During the war the association supplied more than 7,000,000 books to the men in service here and overseas, and the present "Enlarged Program" is a direct result of the war experiences.

Today, it is stated, the general libraries have special departments of technical books, but the American Library Association will encourage wider use of these departments, as well as assist those plants and mercantile establishments in which special technical libraries already have been placed, and will also further the movement to have special technical libraries added to the plants now without them.

Already, it is stated, many far-seeing manufacturers and heads of business institutions have installed in their plants special libraries of technical books for the use of their workers, as well as for reference by themselves. From such libraries the worker may obtain books giving the most minute information upon the industry in which he is employed. Such books are in demand both during the lunch hour and for quiet reading at home.

Where this plan has been followed, it has met with the greatest favor on the part of both employer and the worker. Among the more important organizations which have found that the installation of a special library of technical books was a wise step are B. F. Goodrich Co., General Electric Co., Chamber of Commerce of the United States and the Merchants' Association of New York. There is still, however, a lack of good libraries in business houses, shops, mills and manufactories when the country is considered as a whole and the present movement on the part of the American Library Association is to impress upon every employer the benefits to be derived from these special libraries.

Bonus Plan Proposed for Building Work.

A proposal to apply the bonus system to construction work has been made by the Committee on Methods of the Associated General Contractors. It is said that in the comparatively few instances to date where a successful plan of paying bonuses to laborers and foremen on outdoor work has been volved, the basis of the system has usually been the standard time and bonus method of wage payment.

This plan is based upon the establishment of a standard time for the performance of a certain amount of work, and when this set task has been accomplished, the payment of a substantial bonus for additional work done. In this way the workman is assured of a fair wage every day even should conditions be unfavorable for a large output, and then at other times he is enabled to earn higher wages than would otherwise be possible.

Since the work done by a gang of men is the result of joint effort, the performance per cent for the entire gang is the factor that determines the bonus for each man. Further, the bonus percentage for the gang is the bonus percentage for the foreman and is applied to his salary for the pay period, thereby furnishing him with an effective incentive to secure rapid and efficient work.

HOW THE PLAN OPERATES

Foreman and 12 bridge carpenters assigned to build new deck and install deck on new bridge. Air compressor and pneumatic equipment for boring and tapping furnished.

To illustrate the method of computing wages, suppose that the foreman got $7 per day, that 13 bridge carpenters got $6 per day each, that one man received $5 per day to dress tools, etc., and that one man received $4 per day to tend the air compressor. Assume a standard af .2 days' time for each foot of finished bridge deck and that at the end of a pay period of 13 working days they had completed 905 feet.

The actual days of labor were, say, 16 x 13, or 208; the standard days of labor were 905 ft. x 0.2, or 181; the efficiency was 87% (standard 181 divided by actual 208), which pays a bonus of 8% on wages.

	Wages	Bonus	Total
Foreman	$91.00	$7.28	98.28
Bridge carpenter ...	78.00	6.24	84.24
Man to dress tools..	65.00	5.20	70.20
Man to tend compressor	52.00	4.16	56.16

Engineers' Salaries Under Present Conditions.

Compensation of engineers, considered from the point of view of the decrease in value of the dollar and from that of the intrinsic value of engineering service, is considered at length in a recent report issued by a committee of the American Society of Mechanical Engineers. The report starts out by saying that a great deal of misunderstanding and injustice would be avoided in all our industrial relations were there a clear understanding of the fact that all prices to-day, whether of wages or salaries, or commodities, must be compared with the change which has taken place in the value of the dollar before it can be determined whether the price, measured by an absolute standard, has moved up or down. The report then considers, in series, the changes in wholesale prices, changes in retail prices and in house rents.

"Engineers engaged in business on their own account," continues the rereport, "have to meet the difficulty of raising their fees to offset the changed value of the dollar, a task especially difficult in fields of engineering where work is inactive and the competition for it is keen; yet without such increase they cannot adequately raise the pay of their own employees. This illustrates anew the need for emphasizing the change in value of the dollar, rather than the change in living costs."

The committee reports a reluctance to raise salaries to correspond with the changed value of the dollar because of the idea that prices were to drop back with the conclusion of the war. The present outlook, in the committee's opinion, is that it will

take years to again organize the world's equipment for production and distribution, including finance and merchandising, so that the demands of consumers may be met as before the war and prices be brought back to their former level.

From such considerations as these the committee feel justified in urging that a readjustment of compensation should be based on the assumption that the present scale of prices is to continue for an indefinite time.

INTRINSIC VALUE OF ENGINEERING SERVICE.

Coming down to the intrinsic value of engineering service, the report states:

"It will be generally agreed that the salary of an engineer ought to be at least sufficient to enable him to live in the manner which his position and responsibility call for, and in addition to repay within a reasonable time the investment in time and money he has made in gaining the education and experience which is necessary for his work.

"Unfortunately there has been for fully a decade a tendency to lower the pay of engineers. The law of supply and demand has operated to reduce the pay of engineers in many branches of the profession far below the standards above defined.

"By paying too low a rate for engineering service, the inevitable tendency has been to lower its quality. This has been especially marked in the case of engineers in federal, State, and municipal service. Here the inertia which prevails in all public affairs has prevented the engineers from receiving more than a trifling part of the increase in pay, measured in dollars, that is required to offset the shrinkage in the dollar value.

"The obvious result has been to drive out of the public service the best and ablest men, who can obtain better positions elsewhere, and to leave only the men who by reason of age or inferior ability cannot make such a change."

Steps Toward Federation of Engineering Societies.

Ninety-five leading engineers from all parts of the country, representing the four leading national engineering societies, took the first step towards a federation of engineering societies, when they met for an all-day conference in New York, in January. The feature of the meeting was the passage of a resolution as a recommendation to the several societies approving the recent report of the Joint Conference Committee and calling for a conference in the near future of representatives of engineering organizations throughout the country to formulate plans for a federation of engineering societies. It was proposed to make the date of this proposed conference April 20 and the place, Chicago.

PROPOSALS MADE BY JOINT CONFERENCE COMMITTEE.

Among the specific objects which such an organization might take up, as pointed out in the report of the Joint Conference Committee, were:

1. To render the maximum of service to the nation through unity of action.
2. To give the engineers of the country a more potent voice in public affairs.
3. To secure greater recognition of the services of the engineer, and to provide for his advancement.
4. To promote *esprit de corps* among the members of the profession.
5. To provide the machinery for prompt and united action on matters affecting the profession, among which are:

Registration of engineers;
Washington office for engineering societies;
Department of Public Works of the Government;
Conservation of national resources;
Publicity;
Classification and compensation of engineers;
General employment bureau;
Engineering education;
International affiliation of engineers;
Industrial relations.

NEW ORGANIZATION TO BE FROM BOTTOM UP.

The tentative plan for the proposed organization called for the following component parts:

1. Local Affiliations, preferably under the auspices of local engineering societies or clubs, as follows:

"Local Associations" or "Sections" of the national engineering or technical societies;
Local engineering societies; and
Other local engineers and members of allied technical professions and associates.

These local affiliations when secured are to be headed up in:

2. A National Council, consisting of representatives of national engineering and technical societies and of representatives of local, state or regional affiliations or organizations.

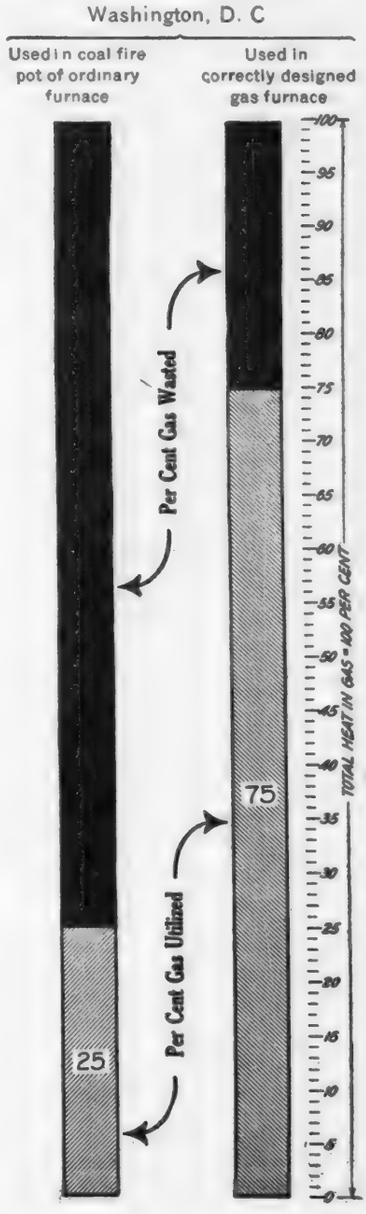
State councils were also recommended wherever and whenever the local conditions warrant.

The proposed basis of representation on the National Council is for each local, state or regional affiliation or organization whose membership is not otherwise represented than through the national engineering or technical societies to have one representative to the National Council for a membership of from 100 to 1000 inclusive, and one additional representative for every additional 1000 members or major fraction thereof.

Each national engineering or technical society is to be entitled to one representative for a membership of from 200 to 2000 inclusive, and an additional representative for every additional 2000 members or major fraction thereof.

Waste of Natural Gas in the Home.

Some surprising figures on the waste of natural gas in the home are given in a recent technical paper (No. 257) issued by the Bureau of Mines. The use of gas, for instance, in coal stoves or coal furnaces is always wasteful due to the fact that the path traveled by the flame is short and the radiating surface relatively small. For this reason it requires three times as much gas for the same heating service as would be required if the gas were used in a properly-


FURNACE HEATING
Based on data published by
Smithsonian Institution
Washington, D. C
Used in coal fire pot of ordinary furnace
Used in correctly designed gas furnace
Per Cent Gas Wasted
Per Cent Gas Utilized
25
75
TOTAL HEAT IN GAS = 100 PER CENT

built natural-gas furnace. Even with perfect combustion in the fire-pot of a coal stove or coal furnace, the waste will usually be about 75%, as shown in the accompanying diagram. Properly-built natural-gas furnaces have a longer fire travel and much more radiating surface than coal furnaces and, for that reason, are much more efficient.

Trade Literature.

ADSCO SYSTEM OF ATMOSPHERIC STEAM HEATING is discussed in a new catalogue just issued by the American District Steam Co., North Tonawanda, N. Y. Following a general description of the system, detailed instructions are given for the installation of this system, accompanied by typical layouts and descriptions of the various devices used. The catalogue concludes with simple rules for figuring radiation. Interspersed with the reading matter are views of different types of buildings in which Adsco systems have been successfully installed, including libraries, office buildings, apartment buildings, residences and industrial plants. Size 6 x 9 in. (standard). Pp. 32.

TRANE DATA, being practical information for engineers and contractors on the subject of vapor heating, are presented in a new catalogue (Bulletin No. 11) received from the Trane Co., La-Crosse, Wis. In addition to the technical data in connection with the Trane system itself and the Trane vapor heating specialties, there is a large amount of information on radiation, boilers, chimney sizes, chimney flues, etc., which constitutes a remarkable contribution on the subject. Some vapor systems, it is pointed out, require more radiation than others. Generally speaking, those open to the atmosphere and not provided with apparatus allowing an increase of 2 or 3 lbs. pressure, use more radiation than is required with a straight steam plant. The Trane system, it is added, is provided with a positive means of sealing the system under pressure, and for that reason can be operated with no more radiation than is required for a straight steam plant. In view of the fact that very few heating contractors figure radiation alike, the company's engineering department has prepared tables for this purpose. These tables are figured by the B. T. U. method with a temperature of 210° at the radiator. Table 1 is for use when the desired inside temperature is to be 70°. This result may be easily converted into the amount of radiation necessary to secure lower or higher inside temperatures by using Table 2. Of course the usual allowances for exposure are to be made in either case. Other tables give the length of pipe equivalent to resistance in elbows, main sizes, riser sizes above the first floor, air and water returns and return risers. Special attention is given to the Trane Thermetal traps which are used on all types of installations with more than 400 sq. ft. of radiation. Size 6 x 9 in. Pp. 32.

ARMSTRONG STEAM TRAPS, designed especially for use with steam radiators or heating coils, steam separators, steam-jacketed kettles; in fact, any steam-heated apparatus from which it is desired to remove the condensate as rapidly as it accumulates, are the subject of a new catalogue (Catalog C) issued by the Armstrong Machine Works, Three Rivers, Mich. The Armstrong trap, it is stated, has been designed with the special purpose of precluding the possibility of passing steam, and at the same time to be mechanically simple and carefully built. The exclusive features of this trap, which are detailed at length in the catalogue, are given as: Much greater capacity than bucket, pot, float, or tilting traps of equal size and weight; small volume, creating high velocity through the trap when discharging; no chance of passing steam; no danger of becoming air bound; quick-acting, and small size. The operation of the trap is covered at length, accompanied by interior views showing the different operating stages. The constructional features are explained in the same way. This is followed by a carefully-compiled table giving the capacities of Armstrong traps at different pressures. There are also views of typical installations. The catalogue concludes with handy price lists and data sheets of the various types embracing six different sizes and styles covering a wide range of uses. Size 6 x 9 in. (standard). Pp. 32.

Death of Andrew G. Paul.

Andrew Greenleaf Paul, president of the Andrew G. Paul Steam Systems Co., Boston, Mass., and known to many as the "father of vacuum steam heating," died at his home in Boston, March 6. He was 71 years old.

Mr. Paul was a well-known figure in the trade long before he became identified with the Paul vacuum heating system. As general manager of sales for the Valve Department of the Fairbanks Company, he originated the design of what was afterwards known as the Fairbanks valve.

One of his associates in that company, W. P. Skiffington, really deserves the credit for the Paul system. A skylight coil in the office was giving trouble, due to air binding, and Mr. Skiffington conceived the idea of attaching an air pump to extract the air from the coil. The story goes that Mr. Paul noticed it one day and asked:

"What have you got there, Bill?"

Mr. Skiffington explained the arrangement and then showed Mr. Paul how it had solved the difficulty.

"Great Scott, man," declared Mr. Paul, "do you realize what this means? Get it patented at once."

This was in 1894. Mr. Skiffington took out a patent the same year, assigning a three-quarters interest to Mr. Paul. Mr. Paul thereupon organized the New England Engineering Company in Boston to market the system. But little progress was made although the royalties for the use of the system were than placed at 2 cents per square foot of radiation. The company was then reorganized as the Paul Steam System Company, and later a Chicago company was started as the Western Paul Steam System Company.

In 1900 the Paul System Company of New York was organized by Albert A. Cryer and associates which marked the beginning of the many important installations of the Paul system in the metropolitan district. The large volume of business handled by this company continued until the expiration of the patents in 1912. During this period the average price to users of the system was 12 cents per square foot of radiation, which will give an idea of the figures involved in royalties alone.

During the life of the patents Mr. Paul was at different times the center of a storm of litigation, but the basic ideas involved in his patents were never successfully assailed in court and after each encounter their validity remained more firmly fixed than ever. His income from royalties grew to large figures, being estimated at $1,000,000 for the ten-year period from 1900 to 1910.

Since that time Mr. Paul has continued in business as head of the Andrew G. Paul Systems Company, in Boston.

He is survived by his widow and one son, Andrew G. Paul, Jr.

Deaths.

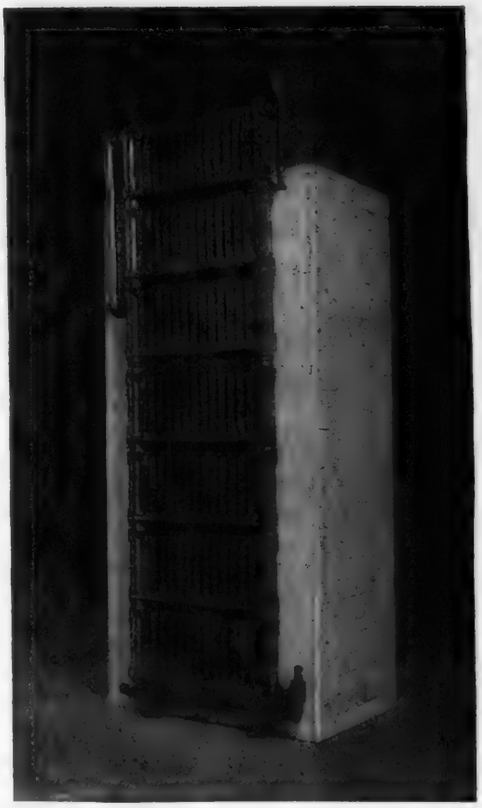
Cyrus Thurston Johnston, mechanical and electrical engineer, eldest son of Clarence H. Johnston, architect, of St. Paul, Minn., died at his home in St. Paul, February 25, after a brief illness. He was a graduate of the Massachusetts Institute of Technology and, at the time of his death had entire charge of the heating, plumbing and ventilating work in his father's office.

Wallace L. Pierce, president of the Walworth Mfg. Co., Boston, Mass., from 1896 to 1913 and since that time chairman of the board of directors of the company, died at his home in Boston, March 5. He was 67 years old. Mr. Pierce was also head of the firm of S. S. Pierce Co., wholesale grocers, which was established by his father in 1874.

F. S. Schardein, president of F. S. Schardein & Sons, Louisville, Ky., and a pioneer heating and plumbing contractor died at the age of 71 years. He was a charter member of the Louisville Masters Plumbers' Association. He leaves a widow, four sons and three daughters. His sons are F. H., George W., O. M. and William Schardein.

Advantages of wall radiators

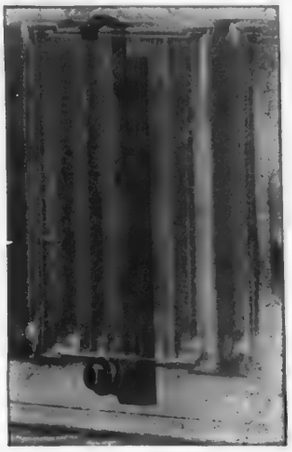
These compact and efficient radiators have rapidly won the favor of architects for use in factories, apartments, theaters, hotels, office buildings and large residences.



A clever arrangement of AMERICAN Rococo Wall Radiators on a column.

AMERICAN Rococo Wall Radiators

can be erected on walls, ceilings, skylights, in narrow passageways, basements, around windows and on girders—in fact in any space which cannot be used for anything else. Easily erected in small units and capable of quick re-arrangement. When weather is mild the units can be shut off, thus preventing waste and over-heating.



Shadow view to show how wall radiator is held by new ARCO bracket. This provides for adjustment after radiator is installed.

Send for catalog "American Rococo Wall Radiators"—shows many interesting installations and gives convincing data as to the efficiency and economy of AMERICAN Rococo Wall Radiators

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The McAlear System.

(Concluded from Data Sheet No. 132-N)

The *atmospheric* system follows throughout the same piping, valves and radiator connections described for the *vapor* system *except at the point where the returns enter the boiler.* Here no automatic return trap is provided but instead a Kieley air trap is substituted, this trap being constructed as shown in cross section in Fig. 5 and with the piping arranged as shown in Fig. 6. These traps are built in eight sizes for various heating system capacities, as shown in Table II.

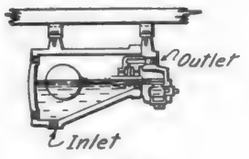


FIG. 5.

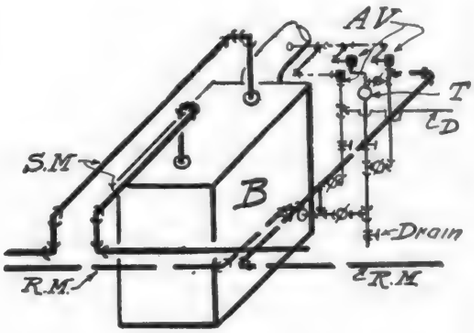


FIG. 6.

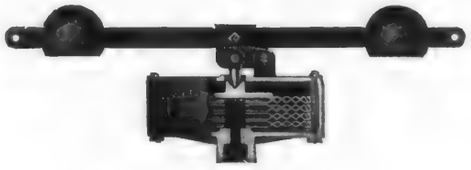


FIG. 7.

TABLE II.

No. of Trap.	Sq. Ft. Radiation.
0	0 to 900
1	901 to 1300
2	1301 to 2000
3	2001 to 3300
4	3,301 to 5000
5	5001 to 8300
6	8301 to 11500
7	11501 to 16500

As can be seen, this trap simply and solely relieves the air from the system and does nothing to help return the condensation against the boiler pressure. Thus, a very small increase in the boiler pressure is sufficient to flood the return and air bind the system if the return main is anywhere near the same level as the boiler water line. For this reason a vapor regulator is used to control the heating boiler, this being a very sensitive device which gives control of the boiler pressure by ounces and will operate at any pressure from 3 lbs. gauge down to 5 in. of vacuum.

VAPOR HEATING—The McAlear Ssystem. No. 132-O

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

WATER HEATING—GRAVITY.

General.

The catalog ratings of water heating boilers are based on the number of square feet of direct water radiation, under still air conditions, that the boiler is capable of supplying under the following conditions of operation:

Fuel—Anthracite nut size.

Temperature of water in the boiler 180° F. No loss of heat by radiation from mains.

The fuel-holding capacity of the fire-pot is assumed to hold a charge sufficient to operate the boiler at rated capacity for eight hours, with 20% left to ignite the fresh charge.

Each square foot of radiation is assumed to emit 150 B. T. U. per hour.

Boiler Rating Required:—To allow for the additional tax on the boiler due to loss of heat by radiation from the piping, for handicap of inferior coal and extra load on the boiler when heating up a cold building approximately 50% to 60% should be added to the amount of total direct radiation installed to ascertain the boiler rating required.

General:—The actuating head, causing the circulation, in a gravity water heating system is due to the difference in weight in the water in the flow and return risers. The water supplied to the radiator is cooled by the heat emission of the radiator and will ordinarily leave 10° to 20° cooler, with an increase in density, over that of the supply riser, thus creating a slight circulating or actuating head and corresponding flow through the system.

A water heating system must be supplied with an expansion tank to provide for the expansion and contraction of the water due to the change of temperature.

The increase in the volume of water from 40° to 212° F. is approximately 4.2% so that for every 23 gal. of water in the system an allowance of at least 1 gal. must be made in the expansion tank—practically a 2-gal. allowance should be made.

Cast-iron radiators have an internal volume of approximately 1½ pints per square foot of rating, and steel radiators and steel pipe hold about 1 pint per square foot rating.

The internal volume of the radiation is generally assumed to be about 50% of the total volume in the system.

Classification of Systems:—Gravity systems are classed as either up-feed systems, with basement mains, or down-feed systems, with overhead mains run in the attic or on the ceiling of the top floor.

The up-feed system may have either a one-pipe basement main or a two-pipe main.

The down-feed system may have either single or double risers.

The down-feed system is somewhat more positive in action, permits the use of smaller risers and provides for the automatic removal of the air from the system.

Under-feed systems are liable to prove defective for single-story structures as the motive head is very small.

The up-feed system, with one-pipe main in basement, is popular and in quite general use.

Either system may be operated with an open expansion tank or with a pressure generator.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

WATER HEATING—GRAVITY.

Two-Pipe Up-Feed System.

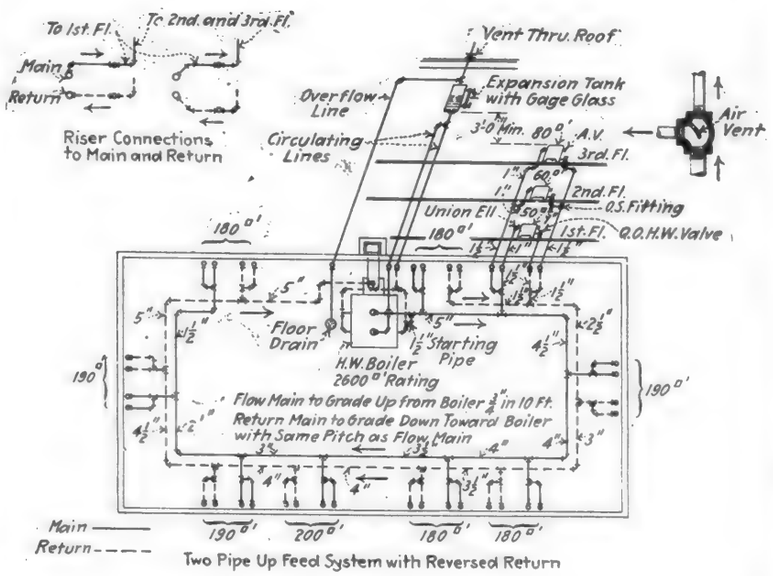


FIG. 1.

The basement plan for a two-pipe up-feed system in shown in Fig. 1. The flow and return pipes and run close to basement ceiling, the flow main grading up from the boiler and the return down toward boiler. The mains are graded ¾-in. in 10 ft. This system should be installed with a reversed return, as shown, in order that the water travel and resistance to flow for each group of radiators is practically the same. Each group of radiators will then warm up at practically the same rate.

The sizes of mains may be taken from Table 1 and branches from Table 2. The main sizes are reduced or increased as rapidly as the change in radiation will permit. In using the tables all mains should be measured back to the boiler, and the risers to any floor are proportioned to supply all the radiation above that floor, as well as the radiator installed on the floor.

A starting pipe installed between the flow main and return near boiler is intended to assist in establishing an initial circulation between the two mains. This pipe varies in size from 1¼-in. diam. in small plants to 2½-in. in large installations.

The branch connections for the second and third floors may be taken off the side of riser branches serving the first floor in order to augment the circulation in the first floor radiators. The branch is usually run full size over to the riser to first-floor radiator in order to favor the lowest radiator.

Connections to radiators for the supply should be made at the top, using a union elbow. The return connection is made at the bottom and should be equipped with a quick-opening water radiator valve, with union connection. Only one valve is required to control the radiator with this arrangement.

Each radiator is equipped with an air valve usually of the key type.

O. S. fittings should be used for the branch connections from second floor radiators to risers.

Sizes of expansion tanks are given in Table 3.

When the main is reduced in size at any point an eccentric fitting should be used to keep the top of the large and small mains in the same place and to avoid air pockets.

Free and complete drainage of the system must be provided for, so that when draw-off cock is opened at the boiler the entire system can be emptied of water.

(Continued on Data Sheet No. 133-B.)

WATER HEATING—GRAVITY—Two Pipe Up-Feed System. No. 133-A

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

WATER HEATING—GRAVITY.

Two-Pipe Up-Feed System.

(*Continued from Data Sheet No. 133-A.*)

TABLES 1 AND 2—WATER HEATING—PIPE SIZES—OPEN TANK.

(Up-Feed, With Basement Mains.)

MAINS UP TO 100 FT.

Pipe Size In. Diam.	Direct Radiation Sq. Ft.	Indirect Radiation Sq. Ft.
1¼	135	100
1½	220	135
2	350	225
2½	460	320
3	675	500
3½	850	650
4	1100	850
4½	1350	1050
5	1700	1350
6	3600	2900
7	4800	3900
8	6200	5000
9	7700	6300
10	9800	7900
12	14000	11400

Notes: Length of main must be measured back to boiler. For mains over 100 ft. reduce capacity in the ratio of $\sqrt{\frac{100}{L}}$

BRANCHES AND RISERS

Pipe Size In. Diam.	Floor First	Second	Third	Fourth
	Direct Radiation Sq. Ft.			
¾	30	45	55	70
1	60	75	85	95
1¼	110	120	135	150
1½	180	195	210	230
2	290	320	350	370
2½	400	490	525	550
3	620	650	690	730
3½	820	870	920	970
4	1050	1120	1185	1250
4½	1325	1400	1485	1560

Notes: First-floor supply riser connections to be taken from top of main and risers above first floor at 45°. All returns into side of main or bottom. (See detail, Fig. 1.)

TABLE 3.—WATER HEATING—EXPANSION TANKS.

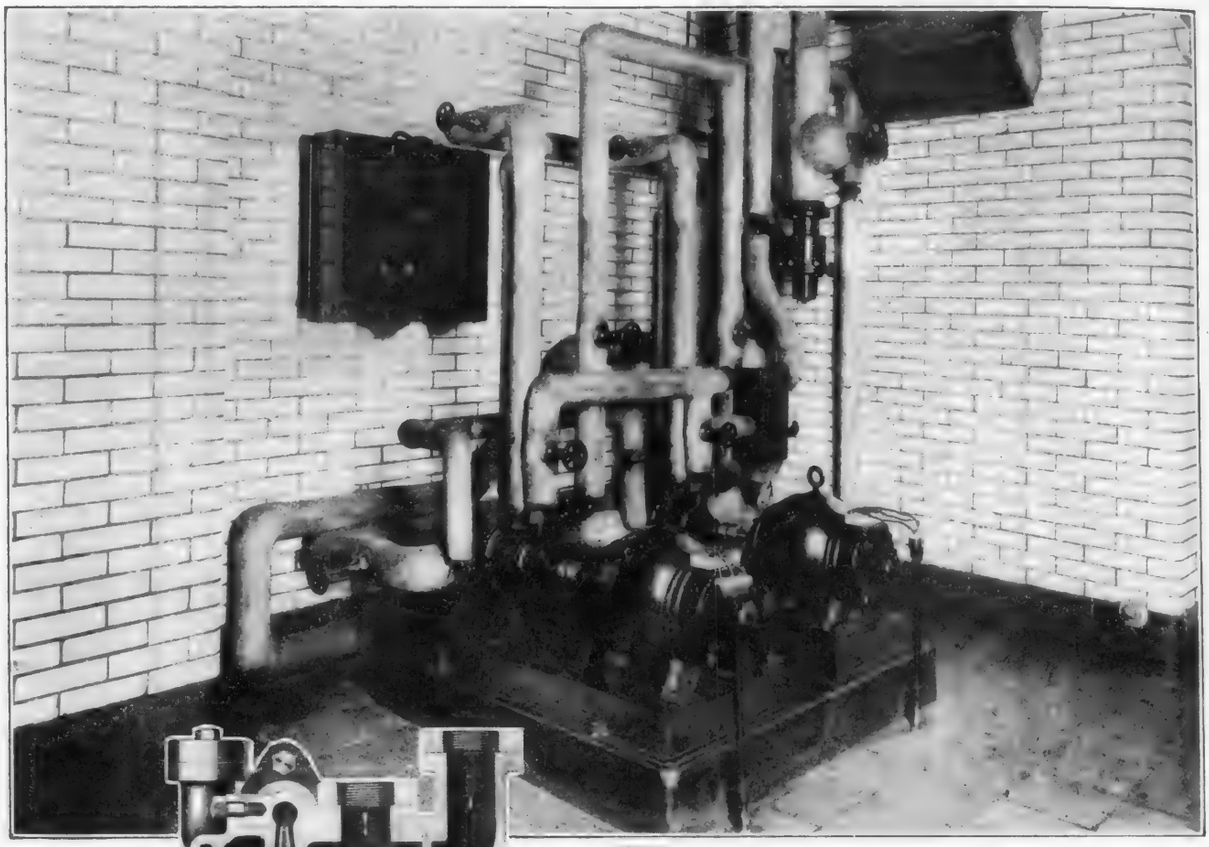
EXPANSION TANKS

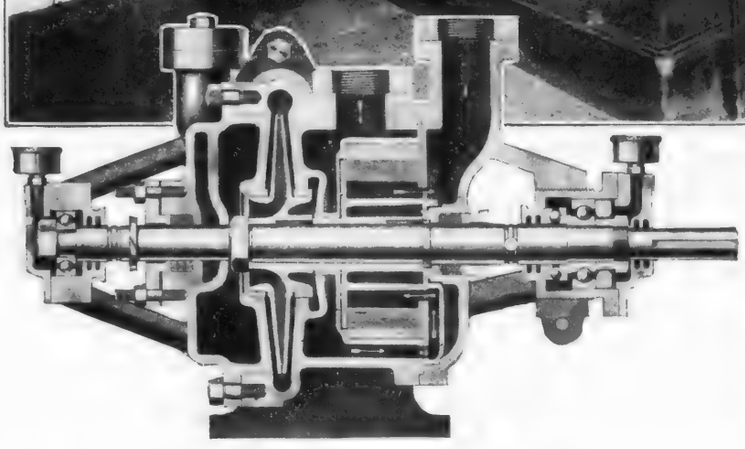
No.	Size in Inches	Capacity Gal.	Radiation, Sq. Ft.
0	10 x 20	8	250
1	12 x 20	10	300
2	12 x 30	15	500
3	14 x 30	20	700
4	16 x 30	26	950
5	16 x 36	32	1300
6	16 x 48	42	2000
7	18 x 60	66	3000
8	20 x 60	82	5000
9	22 x 60	100	6000

Note: Galvanized steel, tested at 100 lbs., tapped 1¼ in. top and bottom, and for gauge glass.

These tables by J. J. Hogan to be used for either one or two-pipe work.

EFFICIENT HEATING *demands the* Jennings Pump





Duplex "C" Unit, Automatic Operation

AMERICAN EXPRESS BUILDING
65 Broadway
New York City

Combined capacity 52,000 sq. ft. direct radiation. Each pump has an air capacity of nineteen cubic feet per minute in addition to a water capacity of thirty-five gallons per minute.

Installed November, 1916.

The motors are only two horse power.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately, four-fifths of the volume handled, are delivered to atmosphere without back pressure The saving in horse power is over fifty per cent.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY

SO. NORWALK, CONN., U. S. A.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

TRADE AND MISCELLANEOUS NOTES

Coming Events.

May 24-27, 1920.—Thirty-first annual convention of the Heating and Piping Contractors' National Association in Cleveland, O. Headquarters at the Hotel Cleveland.

May 25-27, 1920.—Annual convention of the National District Heating Association in Chicago, Ill., Headquarters at the La Salle Hotel.

May 24-27, 1920.—Spring meeting of the American Society of Mechanical Engineers, in St. Louis, Mo.

May 26-28, 1920.—Summer meeting of the American Society of Heating and Ventilating Engineers, in St. Louis. Headquarters at the Hotel Statler.

Miscellaneous Notes.

Washington, D. C.—In a statement explaining janitor troubles in the Washington public schools, Snowden Ashford, municipal architect, declared than one janitor, with insufficient assistants, has so many jobs to do that he cannot faithfully fulfill his main task—that of operating the heating and ventilating plant of his school. He asserted that because of this lack of foresight, many thousands of dollars of valuable machinery are yearly going to waste.

Springfield, Ill.—An ordinance has been passed in Springfield providing for the inspection and regulation of the installation of warm-air furnaces in that city. The order is intended as a fire-prevention measure. The fee for a permit to install a furnace is $2.00 and inspection of furnaces must be made within 24 hours afer installation is completed. The license issued to the person authorized to install furnaces costs $10.00 for the first year and $2.00 for each year it is renewed.

The ordinance contains detailed directions as to how furnaces are to be installed and the manner in which heaters are to be placed and protected, the size and covering of cold and warm air ducts, the size of chimneys and the manner of their construction. Taking cold air from a cellar is forbidden. Cold air ducts must contain an area 75% of that of all the hot air pipes used when air is taken from outside the building and of equal area when it is taken from inside.

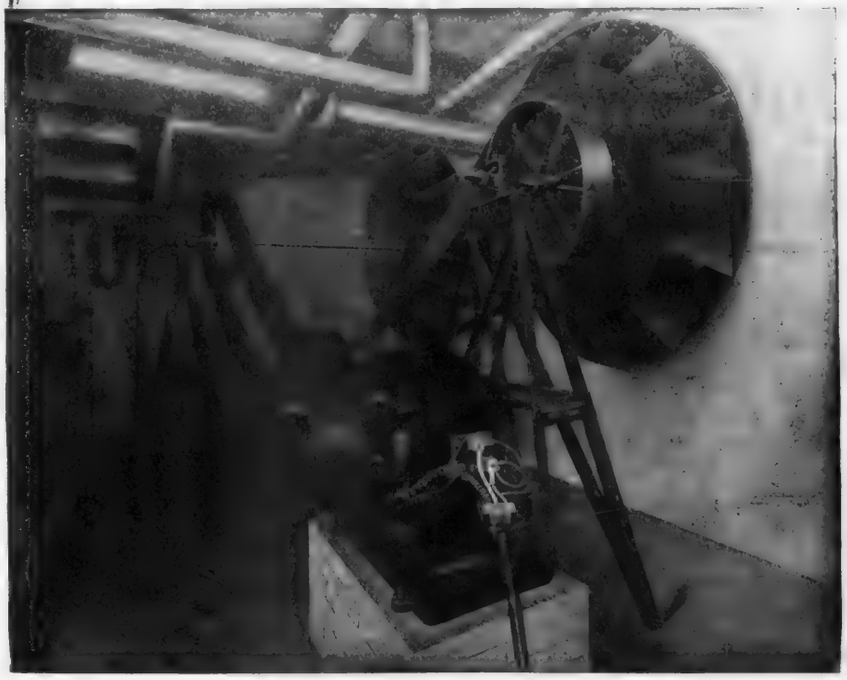
No air may be taken from a cellar. Chimneys must not be of less than 13 x 13 in. inside measurement or 11 x 11 in. inside of lining. In general it provides that there shall be no exposed wood in contact with warm air pipes and that all beams running through cold air ducts shall be covered with asbestos and iron. Proper shields must protect joists and ceilings above a heater. The penalty for violation of the ordinance is a fine of from $25 to $200.

St. Louis, Mo.—An ordinance which went into effect February 6 requires the furnishing of adequate heat to tenants. It specifies that where heat is furnished for a tenant the temperature must not be lower than 70° between 7 a. m. and 10:30 p. m., and not less than 60° between 10:30 p. m. and 7 a. m. Fines are provided running from $5.00 to $500.

HOWARD & MORSE

45 FULTON STREET, NEW YORK

VENTILATING ENGINEERS AND CONTRACTORS



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Blackman

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COMPLETE WITH

Motors, Duct Work and Wiring

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GET OUR PRICES, PROFIT BY OUR EXPERIENCE OF LONG STANDING.

SEND FOR CATALOGUE.

Atlanta, Ga.—The Society of Domestic Engineering, embracing both heating and plumbing contractors, has been formed in Atlanta. The organization is not intended to replace either the master plumbers' or the master steam fitters' organizations. Its objects are entirely social.

National Bureau of Standardization of Plumbing Materials has organized with the naming of the various committees representing the bodies connected with the movement. The officers of the bureau are: President, Clarence V. Kellogg, Chicago; vice-president, James E. Baggot, Chicago; second vice-president, Adolph Mueller, Decatur, Ill; treasurer, J. R. Steneck, Chicago; secretary, Paul Blatchford, Chicago. Some 30 organizations connected with the plumbing trade are supporting the bureau.

Eastern Supply Association held its winter meeting in New York, February 11, at the Hotel Astor, the attendance being unusually large. Among the speakers was William J. Woolley, director of the National Trade Extension Bureau, who stated that of the 23,000,000 homes in the United States, only slightly over 2,000,000 are equipped with proper heating apparatus, and only 5,000,000 with proper plumbing systems.

American Society of Chemical Engineers will hold its summer meeting in Montreal, Canada, June 21-26.

February Building Operations, as reported by the F. W. Dodge Co., show that industrial building still maintains the lead over all other classes of construction activity. The total amount of contracts awarded during February in the territory east of the Missouri and north of the Ohio Rivers, was $216,663,000. This is above the average monthly figure for 1919. Projected or contemplated work to the amount of $533,797,000 was reported in February, an increase of $10,000,000 over that reported for January. In the central West the figures were also good, running above the monthly average for 1919. In the northwest, covering Minnesota. North Dakota and South Dakota, the con-

A New Day in the Kitchen—and the Home

The fine things in a Home now being soiled by "grease carrying fumes" that daily cooking send through a house—even past closed doors—leaving a film for dust collection on decorations, pictures, curtains, walls, etc., are prevented by

A Home without a Kitchen Ventilator is one filled with cooking odors

Without a Ventilator, greasy fumes from the kitchen float through every room

Ventilator Easily Installed in part of window or wall

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

Kitchen Ventilator

Ilg Kitchen Ventilator installed in panel with glass light, allowing upper sash to be lowered when in use. Operates with ordinary extension cord from lamp socket.

The joy of working in a kitchen where the air is always clean, always fresh with abounding energy—free from the taint and discomfort of cooking odors, smoky and steamy air, is sought by every home owner.

Ilg Type "V" Blowers connected to a hood over range offer another effective method of Kitchen Ventilation. Also operate with common extension cord from lamp socket.

Contractors and Dealers will find a growing demand for ILG Kitchen Ventilators. It is being widely advertised. ***Send for "Residence Ventilation" circular.***

ILG ELECTRIC VENTILATING COMPANY, 158 Whiting St., Chicago, Ill.

BRANCHES IN ALL LARGE CITIES

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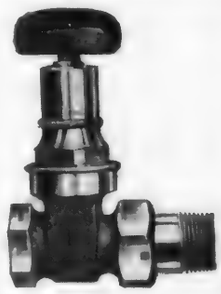
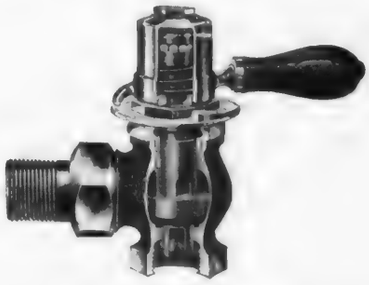
PACKLESS
RADIATOR
VALVES



Insure Satisfaction

A Valve for Every System



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The Dole Valve Company
208 North Wells St. CHICAGO

Jenarco Packing
—for Leaf-proof joints

On saturated steam, hot or cold water and lines of other fluids, JENARCO Sheet Packing makes an absolutely tight and durable joint. JENARCO is a vulcanized rubber packing, red in color, extremely tough and strong. It will not become brittle and crack nor crumble or squeeze out of the joint. It retains a degree of flexibility which insures perfect tightness under the most exacting conditions.

JENARCO will not deteriorate with age. It is easily applied and is always ready for service, making it excellent to keep on hand for emergencies.

Know genuine JENARCO by its mark and its red color. Obtain it through your supply man.

Gaskets ready cut in Standard shapes and sizes may be furnished also.

For high pressure superheated steam service use Jenkins Compressed Asbestos Jointing.

JENKINS BROS.

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Boston Washington San Francisco St. Louis London
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JENARCO Jenkins Packing

The extra profit in simplicity

AFTER all, the thing you really want in a radiator trap is continuous service—whatever the mechanism. While the chances of failure may not increase directly with the number of parts, it is nevertheless a fact that with simpler design, there are fewer parts to get out of order—and for you to fix at your own expense.

There is only one moving part in the Johns-Manville Radiator Trap—a floating ball. And because there's nothing about it to adjust—there's an extra profit for you in the simplicity that means freedom from repairs and adjustments.

How it works

The floating copper ball, of calculated weight, is held against the outlet by steam pressure when there is no water to discharge.

But as more water flows into the trap, the ball floats, rolling up and exposing the outlet through which the water escapes, and carries with it any air that may be present.

When the water level falls again, the ball rolls down, closing the discharge outlet and preventing loss of steam.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities
For Canada, Canadian Johns-Manville Co., Ltd., Toronto

Through—
Asbestos
and its allied products
JOHNS-MANVILLE
Serves in Conservation
Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Prevention Products

JOHNS MANVILLE
Radiator Trap

tracts came to $6,017,000, as compared with $7,246,000 for January.

"Own Your Home" Exposition, to be held at the Grand Central Palace, New York, May 1-8, will feature, among other things, a motion-picture play entitled "The Home Builders." The picture tells the story of a young couple recently engaged, who decide to build. The picture takes them through the necessary steps beginning with the real estate agent's office and a visit to the property, insuring the tile, securing the mortgage, consulting the architect and contractor, and the actual building and furnishing of the home. The picture, it is stated, gives the information so often desired as to just how to go about building a house. It will be put on by the National Graphic Publicity Service of New York.

Special Library Census is being undertaken by a committee of the Special Libraries Association with the purpose of providing a directory of manufacturers' libraries that have specialized on certain subjects. It is intended to list the special information sources of the country. The questions asked are: Name of institution or company. Name by which library is known; Name of librarian or custodian; Can it be classified as any of the following: financial; business; legal; engineering or technical; institutional; municipal; reference; agricultural; If not, how can it be classified? Does it serve a special clientele? Would your librarian be willing to assist other special libraries to a reasonable extent? The above data should be sent to Wm. F. Jacob, Chairman Library Census Committee, c/o General Electric Company, Schenectady, N. Y. who will be glad to answer any questions relating thereto.

Western Society of Engineers has elected the following officers for 1920: President, F. K. Copeland, Chicago; first vice-president, C. F. W. Felt, Chicago; second vice-president, J. L. Hecht, Chicago; third vice-president, Linn White, Chicago; treasurer, F. F. Fowle, Chicago.

Paul Wunderlich, mechanical engineer with the George A. Fuller Co., New York, has left for Japan as a representative of that company. He desires to receive catalogues and data in all mechanical, electrical and sanitary equipment. They should be sent in duplicate, care of the George A. Fuller Co., Flatiron Building, New York.

Carnegie Corporation of New York, has announced its purpose to give $5,000,000 for the use of the National Academy of Sciences and the National Research Council. It is understood that a portion of the money will go partly to erect in Washington a home for the two beneficiary organizations. The remainder will become a permanent endowment for the National Research Council. The National Research Council is a democratic organization based upon some 40 of the great scientific and engineering societies of the country. It is not supported or controlled by the government, differing in this respect from other similar organizations in other countries. It was organized in 1916.

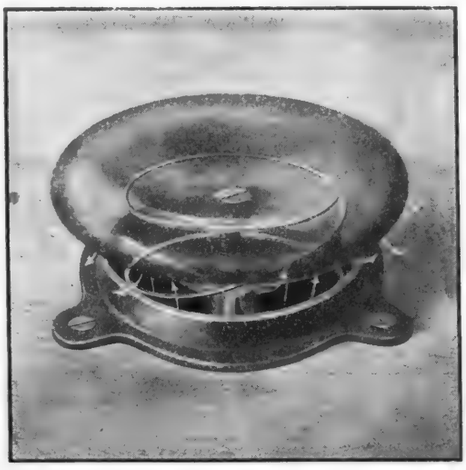
Advertising Engineers, Inc., 50 Union Square, New York, have opened an office for carrying on the business of counselors and complete service for advertisers of technical products. Curtis F. Columbia, C. E., will act as eastern manager. Others identified with the organization are Virgil G. Marani, C. E., Victor Hugo Halperin, Ph. B., and F. W. Liggett, E. E.

Central Station Heating Notes.

Springfield, Ill.—The State public utilities commission has suspended until June 22, 1920, the proposed increases in steam heating rates in Decatur, Urbana, Champaign, Bloomington, Normal, Danville and Galesburg. Petitions for increased rates were presented by subsidiary companies of the Illinois traction system which furnish service in these cities.

Peoria, Ill.—The county board has voted to abandon the project for a private heating plant for the court house and will arrange to use city

Lehigh Mushroom Ventilators



Saving in Cost
Economy in Installation
Ease in Adjustments
Efficiency in Operation

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MANUFACTURERS OF
FANS, AIR WASHERS AND VENTILATING EQUIPMENT
ALLENTOWN, PA.

DATA BOOK: Write for your copy of our new data book on fan engineering

"Sirocco"
TRADE MARK

Interior View of Sirocco Equipment of Buick Motor Co., Flint, Mich.

Conditioned Air in the Automotive Industry

Manufacturers of automobiles and automobile accessories are considered among the leaders in the application of heating and ventilating and air conditioning in their plants.

The installations they have made have been based upon careful study of the conditions as applied to the employe as well as the general manufacturer. They have found that in order to keep production up to the necessary standard, workers must be supplied with clear, pure air.

The view above illustrates "Sirocco" Air Conditioning equipment installed at the Buick Motor Car Company at Flint, Michigan. With this method the air is washed of all impurities and sent out into the factory heated to the proper degree for comfort in the winter and cooled to the right temperature during the summer months.

Air conditioning equipment is only a part of a number of heating and ventilating products bearing the "Sirocco" mark. If you have a problem that involves ventilating or air conditioning especially, we would like to have you get in touch with us.

AMERICAN BLOWER COMPANY, Detroit, Michigan

Branches in all large cities

Canadian Sirocco Company, Ltd.
Windsor, Ont.

heat. J. M. Shea & Co. are making the necessary changes which will cost $10,440.

Salt Lake City, Utah.—The near completion of the most up-to-date central heating plant in Social Hall Avenue, Salt Lake City, is expected to prove a factor in solving the local smoke problem. Already the success of the smokeless plant in Social Hall Avenue is giving rise to plans for a similar plant on a larger scale which would heat the entire down-town district. The Social Hall Avenue plant has a boiler capacity of 650 H. P. and a heating capacity of from 40,000 to 50,000 sq. ft. The plant was built under the auspices of the Mormon Church. This is the second large heating plant to be built under the auspices of the church. The first was established some years ago at the time of the erection of the Hotel Utah, furnishing heat to that hotel and to all the church buildings. This plant was later purchased by the Utah Light & Power Co., and forms part of its present heating system.

Fairmount, Minn.—Fairmount Public Heating Co., Fairmount, Minn., has been organized with a capital stock of $200,000, to establish a central heating system in that place. W. T. Bain and J. E. G. Robb, of Milwaukee and Minneapolis (Bain and Robb) were awarded the contract to install the system at a price of approximately $170,000. The plant will be a vacuum steam system, utilizing the exhaust of approximately 1000 H. P. from the new electric light plant under construction. Bain and Robb are the engineers, as well as the contractors, for this work. No other bids were asked. Construction was to start as soon as the weather permitted. The officers of the heating company are: President, Elmore Houghtaling; vice-president, L. J. Franse; secretary, Alfred Horne; treasurer, Howard Waite; attorney, J. E. Haycraft: directors, O. R. Wolf, T. A. Lawler and William M. Hay.

Manufacturers' Notes.

International Heater Co., Utica, N. Y., has recently closed one of the largest realty deals in Utica through the purchase of the property known as the Utica Pipe Foundry. This comprises 40 acres, with buildings, railroad sidings, etc., east of the company's present plant. The buildings cover 125,000 sq. ft. of floor space and comprise all those required in operative foundry work, such as engine and boiler house, machine shop, etc. The plant has been idle for several years. The first building to be put in shape will be the moulding room, with 30,000 sq. ft. of floor space. This will be manned immediately to care for the increased demand for the company's line of boilers and furnaces. When this plant is fully equipped and manned, the manufacturing capacity of the International Heater Company will be more than doubled. The company has also purchased the three-story and basement office and warehouse building at Wentworth Avenue and West 22nd Street, Chicago, to take care of the warehouse facilities of the Chicago branch. A short time ago, the company purchased its present warehouse in Nashua, N. H., to increase the stock carried for the Boston and East New England market. The company's New York office has been moved to the eighth floor of the Grand Central Palace, Lexington Avenue and 46th Street, but the premises at 601 West 27th Street will still be retained for warehouse and shipping offices. The change to the Grand Central Palace gives better display facilities for the convenience of architects, house owners and dealers.

American Foundry & Furnace Co., Bloomington, Ill., held the annual meeting of its sales force in Bloomington, February 17-19. Twenty-five out-of-town representatives of the company were among those present.

Richmond Radiator Co., New York, announces the election of a new board of directors at its annual meeting February 16. This action was in

This New Improved CYCLOIDAL Multivane Wheel

was designed for heating and ventilating requirements where the ordinary wheel was not sufficient. You will note that the vanes in this wheel curve forward and are set at an angle to the shaft. This, a patented feature, allows a uniform, unrestricted flow of air across the entire width of the wheel. Highest effiiciency of operation, noiselessness and durability are guaranteed CYCLOIDAL features.

Write for further details.

Garden City Fan Co.
Est. 1879
CHICAGO, ILL.
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L. J. WING MFG. CO., New York

THE MARK OF HIGH EFFICIENCY
Cycloidal

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Graham, Probst, Anderson & White,
Architects

W. G. Cornell Co.,
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Massachusetts Fans Move 388,372 Cubic Feet of Air

per minute in The Hotel Cleveland. For the ventilation of this hotel the engineers chose 16 single and 2 double width Massachusetts Modified Squirrel Cage Fans, because of their great capacity, extreme efficiency and economy of operation.

The services of our engineering department are at the disposal of any architect or builder whose plans include the installation or remodelling of a ventilating system.

Condensed Bulletin of Fans, Blowers, Heaters, etc. Sent Free on request.

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response to an appeal which had been sent out by a special stockholders' committe appointed for the purpose of obtaining proxies to bring about a change in management. The new board of directors, which is made up largely of the stockholders' committee, met immediately after the stockholders' meeting and elected new officers as follows: Chairman, William Proctor; president, Franklin J. Matchette; vice-president, P. H. Seward. Mr. Proctor is a director of Proctor & Gamble Co., Cincinnatti, O. Mr. Matchette is president of the Servidor Company, New York. The general management of the company will be in the hands of Vice-President P. H. Seward, who will devote his entire time to the company's interests, Messrs. Proctor, Matchette and Seward forming an executive committee of the board of directors. The announcement further states that F. H. Moore, former president, and P. M. Beecher, former vice-president, are no longer connected with the company in any capacity. It is stated that it is the intention of the new interests to immediately take steps to build up the business of the Richmond Radiator Company in all its lines and to do everything possible to restore the prestige of the company to that which has been enjoyed during the 45 years that the Richmond name has been associated with heating products.

Buffalo Forge Co., Buffalo, N. Y., announces that at a recent meeting of the company, the following officers were elected: President, Henry W. Wendt; vice-president and treasurer, Edgar F. Wendt; vice-president and secretary, Henry W. Wendt, Jr., vice-president and sales manager, C. A. Booth. The new directors include the above-named officers and, in addition H. S. Whiting.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces that an insurance policy for $500.00 will be given entirely without cost to every employee who has been in the service of the company for six months or more. The plan is effective March 1. In addition, after April 1, the employees may increase the value of their policies to amounts varying from $1000 to $2000, depending upon their length of service and continuity of savings. All employees who have been in the company's service for six months or longer and who deposit a sum each payday in the Employees' Savings Fund, equal to 2% or more of their earnings, will not only receive 4-½% interest compounded semi-annually on such deposits but, in addition, will automatically have their insurance increased to amounts up to $2000, depending on the length of time they have been with the company. For example, a man who has been in the service of the company for at least 15 years and has regularly deposited in the Employees Savings Fund 2% or more of his salary, on which he regularly receives 4-½% compound interest, is presented with an insurance policy in one of the established companies for the sum of $2000, at no cost whatever to him.

After an employee has maintained the required deposits for a period of five years he may discontinue or withdraw his deposits from the savings fund without in any way affecting the value of his insurance policy. In order to provide for cases where employees need some money and do not wish to disturb their savings and thus affect the value of their insurance policy, loans will be made by the company to the extent of 90% of the amount to the credit of the employee in the savings fund without in any way affecting the value of the insurance.

This insurance is to be made effective at all of the various offices and plants of the Westinghouse Electric Company and will affect approximately 50,000 people.

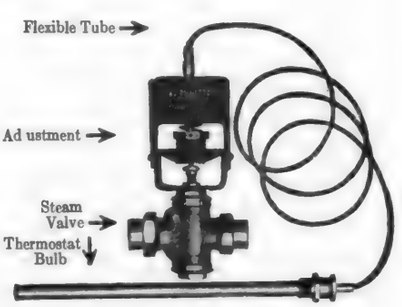
Monitor Bi-Loop Radiator Co., Lancaster, Pa., will build a one-story building, 50 x 110 ft., to cost $15.000.

Petroleum Heat & Power Co., New York, manufacturer of the Fess rotary oil burners, and operators in fuel oil, will build a one and two-story steel plant 100 x 200 ft. at Stamford, Conn., to cost $100,000. F. Lathrop Ames is president of the company.

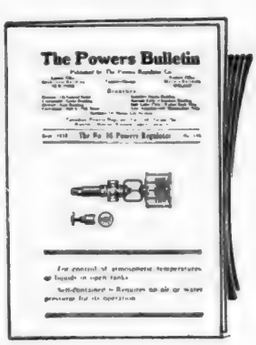
Landers, Frary & Clark, New Brittain, Conn., manufacturers of electrical heating and vacuum cleaning apparatus, has increased its capital stock

Eliminate the Human Element from heat control by specifying the

Powers Heat Regulator



Powers Regulator No. 11



Whenever there is a need for maintaining a definite, even temperature the Powers Automatic Heat Regulator is your answer. The regulator shown at the right is the Powers No. 11. It is now used in thousands of factories and homes. Fully described in our Bulletin 129. This is only one of the many types of Powers Regulators, some of which will exactly meet your requirements. Allow our more than 30 years of experience to be of service to you in your problem.

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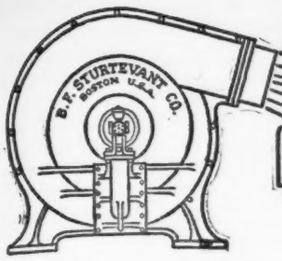

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Why Afternoon Drowsiness?

THE need of uninterrupted ventilation in schools is extremely important, for the tendency toward drowsiness is one of the most pronounced sources of student inability to grasp the thoughts transmitted by the teacher.

FREQUENT and positive air change successfully combats the inalertness so manifest where vitiated air exists.

THE East Side High School in Cincinnati, for example, has been equipped with the

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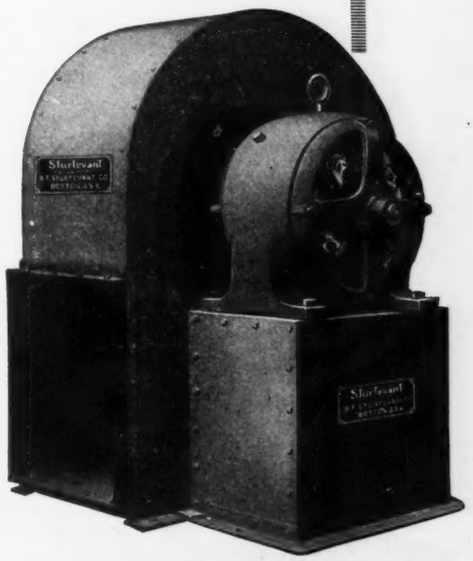
Heating and Ventilating System

whereby each pupil receives 30 cubic feet of pure, fresh air every minute.

THROUGH this frequent air change student and instructor alertness is not alone improved, but the school attendance is increased through less sickness resulting from the breathing of impurities.

STURTEVANT equipped schools represent the very best examples of public-building air engineering practice. Simplicity of design, efficiency of operation, and durability of apparatus are decidedly present in these systems.

Literature and engineering service are at your disposal



Sturtevant Patented Multivane Fan with Motor

B. F. STURTEVANT COMPANY
HYDE PARK, BOSTON, MASSACHUSETTS
AND ALL PRINCIPAL CITIES

from $5,000,000 to $6,000,000. This company some time ago took over the business of the United Vacuum Appliance Co., of Connersville, Ind.

Kewanee Boiler Co., Kewanee, Ill., has incorporated in New York, with a capital stock of $100,000. Incorporators: E. E. Baker, B. F. Baker, and Homer Addams.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has appointed Alexander Taylor to the position of assistant to vice-president in general charge in all plants of production, stocks and stores. He was for many years manager of works. R. L. Wilson has been promoted from general superintendent to works manager of the East Pittsburgh works. E. R. Norris has been appointed director of works equipment, in charge of machinery, tools and methods in the various plants. Other appointments are: G. M. Eaton, chief mechanical engineer for the company; C. W. Johnson and H. W. Cope, assistant directors of engineering; C. H. Champlain and E. S. McClelland, assistant works managers. John E. Bonham, assistant to works manager; E. S. Brandt, supervisor of equipment and methods.

Consolidated Utilities Corporation, Chicago, Ill., manufacturer of the Matthews line of home lighting and power plants, reported more sales during January and February than were sold during the whole of 1919. The year 1919 was the largest in the history of the company.

Chicago Pump Co., Chicago, will build a one-story machine shop, 125 x 175 ft. at 2322-2326 Wolfram Street, Chicago, to cost $65,000.

Plant Engineering & Equipment Co., Inc., New York, engineers and manufacturers of steam and power specialties, as announced last month has opened a branch office in Newark, N. J., in charge of M. William Ehrlich. The address of the Newark branch is 282 South Street.

Lunkenheimer Co., Cincinnati, O., will build a new three-story plant at Carthage, O., to cost $1,500,000.

Connecticut Blower Co., Hartford, Conn., manufacturer of blower and exhaust systems, has appointed C. F. Berg as sales engineer for the Boston branch, covering a large part of New England.

Massachusetts Blower Co., Boston, Mass., announces the reopening of its Boston office in the Kimball building, 18 Tremont St., with A. C. Bartlett in charge.

Sloan Valve Co., Chicago, Ill., has opened a new district sales office in Albany, N. Y., at 11-13 Steuben St., with H. B. Kinney in charge.

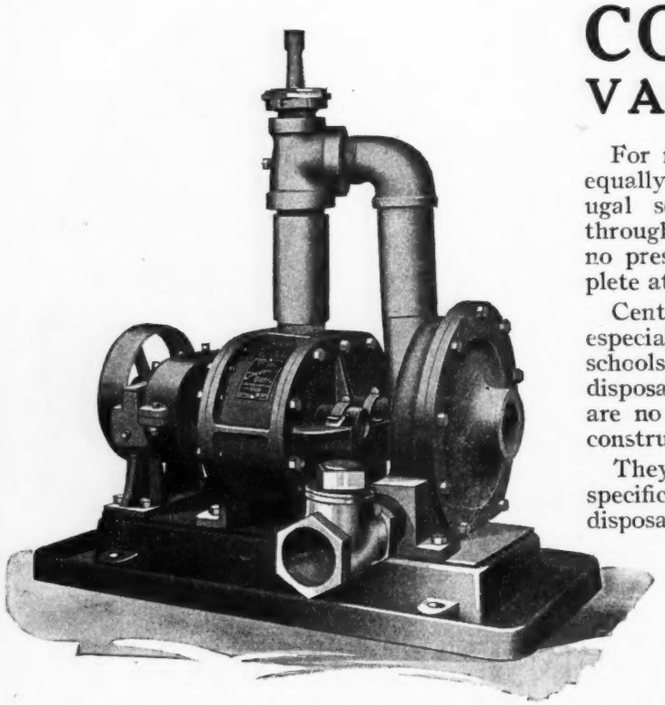
Dole Valve Co., Chicago, Ill., manufacturer of Dole valves and other heating specialists is building a two-story plant, 100 x 124 ft., at 1923-1933 Carroll Avenue, Chicago. The new plant will cost $90,000.

National Tube Co., Pittsburgh, Pa., has plans made for a new tube mill in Gary, Ind., to cost about $40,000,000. The plant will include four blast furnaces, in addition to tube mills, office buildings shops and other structures.

Curtis & Curtis Co., Bridgeport, Conn., manufacturers of pipe threading machines, has increased its capital stock from $200,000 to $1,200,000.

Crane Co., Chicago, Ill., has increased its capitalization from $17,000,000 to $27,000,000, the $10,000,000 being in 7% preferred stock which is offered for subscription to employees. The par value of the company's common stock has been changed from $100 to $25. A new four-story warehouse for the company is being built in Atlanta, Ga. It will be four stories high and will cost $120,000.

American Radiator Co., Chicago, Ill., reports a prosperous year ending December 31, 1919. Net profits, after reducing charges and Federal taxes, were $3,036,247, as compared with $2,656,213 for the previous year. The total profits of the patent and constituent companies were $3,571,843. This makes an even better showing when the last report covered eleven months, while the previous report covered twelve months. The company's earnings are equivalent to 7% on the preferred stock and 27.3% on the common stock. In his annual report President Clarence M. Woolley said: "The manufacturing capacity of the company has been taxed to its limit since July 1. Sufficient orders



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For removing dry dust or scrub water they are equally efficient. By means of the patented centrifugal separator all dirt and water are discharged through a check valve directly into the sewer under no pressure. The separation is thorough and complete at all times.

Centrifugal type Connersville vacuum cleaners are especially adapted for use in office buildings, hotels, schools and hospitals where a comp'ete and final disposal of dirt and scrub water is needed. There are no tanks, bags, screens or buckets used in their construction.

They are made in various sizes to meet any specifications. Competent engineers are at your disposal to help solve your cleaning problems.

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United Vacuum Appliance Division
Connersville, Indiana
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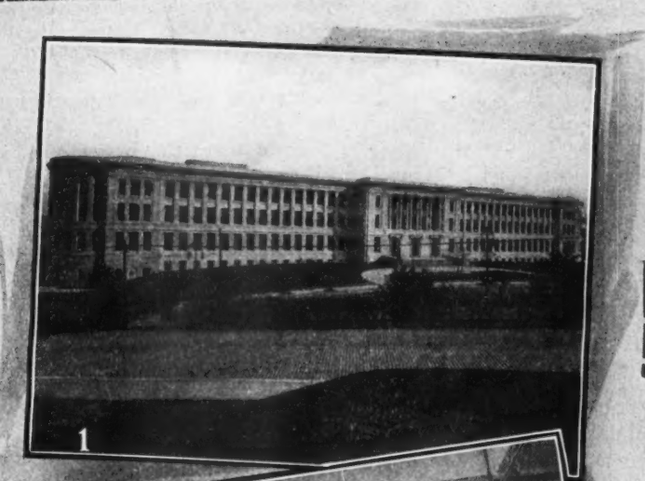

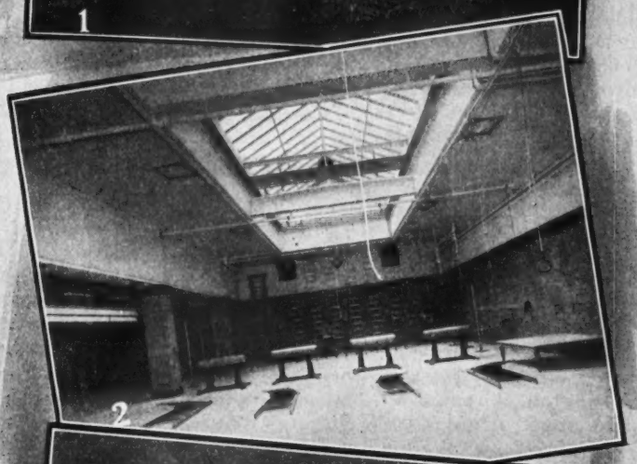

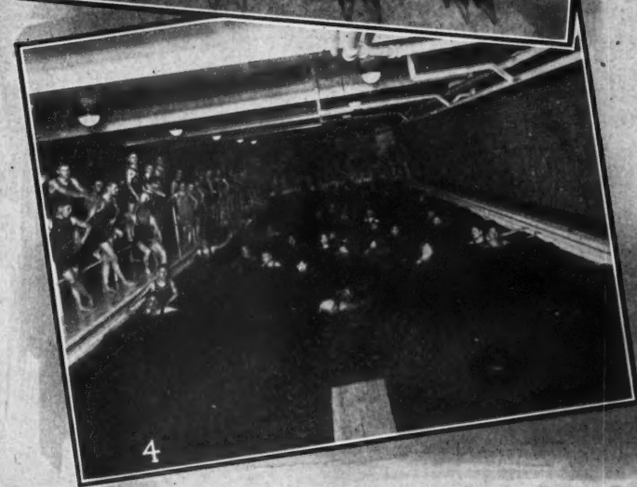

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Pittsburgh's most beautiful high school building is Carrier Equipped.

Every particle of air that enters this building is washed—freed from germ laden, disease breeding dust.

This pure fresh air is then warmed to the proper temperature and enters each room at just the right temperature and humidity.

In the gymnasium a cool dry atmosphere is maintained.

The room containing the swimming pool, on the other hand, requires a warm moist air, and this is made possible only with a Carrier Washer.

The class rooms and auditorium are kept at just the right temperature and the desert atmosphere common in many schools is entirely eliminated.

This ever-changing supply of clean fresh air means healthier students, better work and a cleaner building.

Let our Engineering Department assist you on your next school, office building or hospital job.

Our data is at your disposal.

Write Dept. 36 for catalog and data.

Carrier Air Conditioning Company of America

Buffalo, New York

Buffalo

have been booked to engage existing producing capacity for a considerable portion of the year 1920. In fact, it has been found advisable to make extensions to several of the plants in order to meet the already existing demand."

Richardson & Boynton Co., New York, has moved its general offices and show room to 258-260 Fifth Avenue, north of 28th Street, where more convenient and additional facilities have been secured.

American Blower Co., Detroit, Mich., held its annual sales conference in Detroit recently at the Statler Hotel. A special session was devoted to export business, under the leadership of Vice-President and General Manager F. R. Still who discussed at length his trip to the Far East and back in which he made a complete tour of the world.

American Radiator Co., Chicago, Ill., has opened a new branch office in Peoria, Ill., at 416 Fulton Street.

United States Radiator Corporation, Detroit, Mich., has opened a new branch office in Seattle, Wash., with E. A. Stark in charge. Mr. Stark has represented the company in territory west of Pittsburgh. The Seattle branch will cover the Northwest and Pacific Coast territory, as well as the Oriental export trade. The company has also opened a new office and warehouse in Milwaukee, Wis., the office being located at Room 60, Northern Trust Building, and the warehouse at the Erie and North western Railroad tracks.

Monitor Bi-Loop Radiator Co., Lancaster, Pa., has appointed Joseph E. Herrick as its New England manager. Mr. Herrick formerly represented the National Radiator Company in New England. A branch office will be opened shortly in Boston. Mr. Herrick is at present serving his second term as a member of the Massachusetts House of Representatives.

New Firms and Business Changes.

Ruby Boiler & Radiator Co., New York, has been organized by David C. Rubin, formerly with the United States Radiator Corporation; and I. Jacobs, formerly treasurer of the Hudson Boiler Mfg. Co., and New York office manager of the Atlantic Radiator Company. The new company has taken quarters at 330 West 42nd Street, and will carry on a general business in boilers, radiators and heating specialties.

John E. Hubbell, counsellor-at-law and solicitor of patents, formerly of Philadelphia, has opened offices in New York, at 469 Fifth Avenue, where his practice will be devoted exclusively to patent and trade-mark matters.

Henry Ewinger Plumbing and Heating Co., Burlington, Ia., has increased its capital stock from $7,000 to $25,000.

Vesuvius Engineering Co., Inc., 7 West 42nd St., New York, has been organized to take over the business of the Vesuvius Sales Organization and the Cuyler-Hughes Co. The company will handle the Vesuvius gas-fired steam and water heating apparatus.

Commonwealth Brass Corporation, Detroit, Mich., has appointed P. Tazelaar as manager of its New York branch office at 48 East 41st Street.

America Heating & Supply Co., Rockford, Ill., has elected B. D. Wellman, of Chicago, as vice-president, and H. W. Leech as secretary and treasurer, succeeding Harry V. Van Denberg. Mr. Wellman was formerly with the American Radiator Company. The America Heating & Supply Company was incorporated in 1910 when F. K. Houston disposed of the business to devote his entire attention to the vacuum cleaner trade.

Cochran-Sargent Co., Minneapolis, Minn., heating and plumbing jobbers will open a branch in Sioux Falls, S. D., in the old Sherman transfer house just east of the Illinois Central station. R. B. Montgomery of Minneapolis will be in charge.

Van Denberg Supply Co., Rockford, Ill., has been organized by Harry Van Denberg who recently resigned as an officer of the America Heating & Supply Co. The company, which has taken quarters, at 126 North Water Street, will engage in the jobbing and contracting business.

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The Recognized Standard for School-house Work

The finest school buildings of the United States are equipped with Spencer Vacuum Cleaning Systems. Their selection has not been determined by chance or price considerations, but is the result of their demonstrated ability to clean a school building more rapidly and more thoroughly than it can be cleaned by any other method, and to give effective and dependable service over a period of years.

For the past ten years, many of the Cincinnati Public Schools have been cleaned with Spencer apparatus, making it the natural choice, therefore, for the new

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The best is the cheapest in the long run. The services of our Engineering Department are at all times available.

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